

Operating Systems

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**Computer Architecture and
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Introduction

This course report is talking about operating systems, and how they are manage it. It explain the functions of an operating system, using Windows as the main example: task management, application management, file and directory management. This work is also showing practical examples of Command Line Interface (CLI) commands in Windows and Linux, together with simple scripts wrote in Batch and Bash. Each example have a screenshot and a short explanation of the command or script. The purpose of this report is to show a clear understanding about how operating systems work, and how Windows and Linux is compare in practice.

Key functions of general Operating Systems

Microsoft Windows was released first time in 1985, like a graphical extension of MS-DOS [1]. It become the most used operating system in the world, running in about 90 percent of the personal computers [1]. Windows is important because is connecting the hardware and the software of computer, and let users to manage files, run programs, and control devices in easy way [2].

Task Management:

Task management is one of main job that operating system do. Windows use a tool called Task Manager to show all apps and background process that is running in the computer [3]. It shows how much CPU, memory, disk and network each process is using it. From here, user can end a task that is not responding, or check which programs is using too much resources. Figure 1 shows Task Manager open in Windows 11, with list of running apps and background process, and their resource usage. This help to keep the computer running smooth.

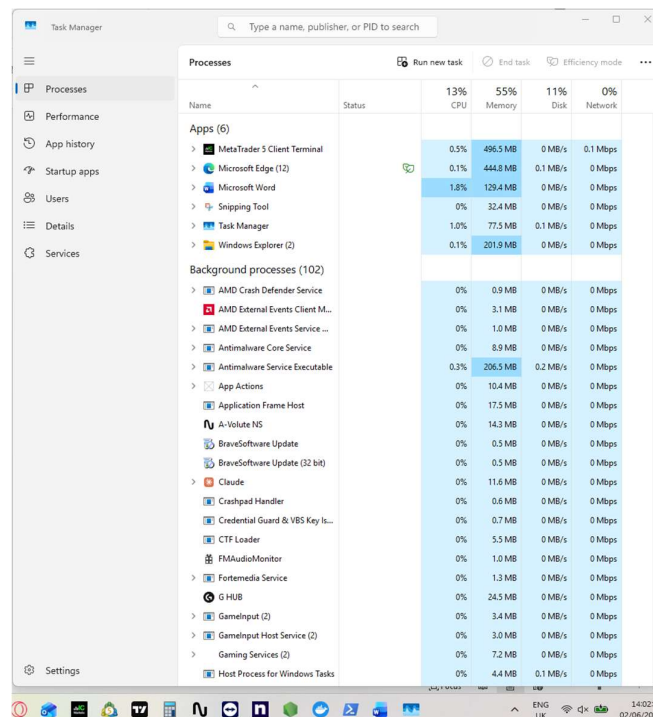


Figure 1: Task Manager showing running apps and background processes

Application/Program Management:

It shows how Windows lets users to install, update, and remove programs. This is done in the Settings app, in the Apps section [4]. From here, users can see all installed apps, change the default apps for files and links, and control which apps are starting automatically with Windows. Figure 2 shows the Apps page in Windows Settings, with options like Installed apps, Advanced app settings, Default apps, and Startup. This is important because it lets users keep their computer organized, remove programs that are not needed, and control how apps behave without using extra software.

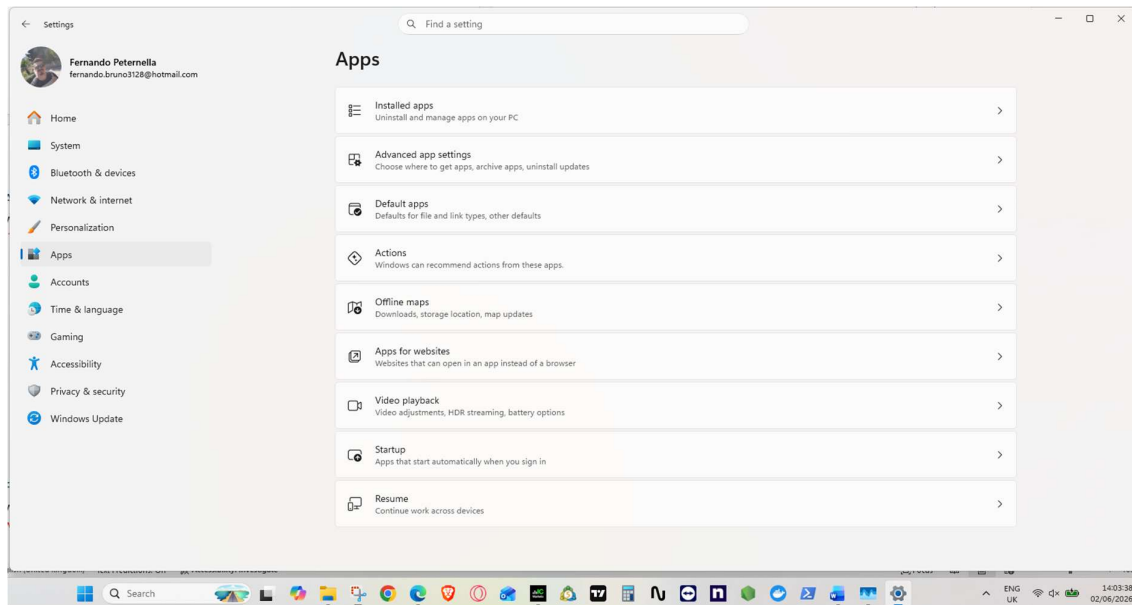


Figure 2: Windows Settings, Apps page

File/Directory Management:

File and directory management is let user to create, move, copy, rename and delete files and folders. In Windows, this is done using File Explorer [5]. File Explorer shows the folders in the computer, like Desktop, Documents, Downloads and Pictures, and also files that is saved in cloud, like OneDrive. Figure 3 shows the Home view of File Explorer, with list of recent files, their location and the date they was accessed. Good file management help user to find files fast, keep folders organised, and not lose important documents.

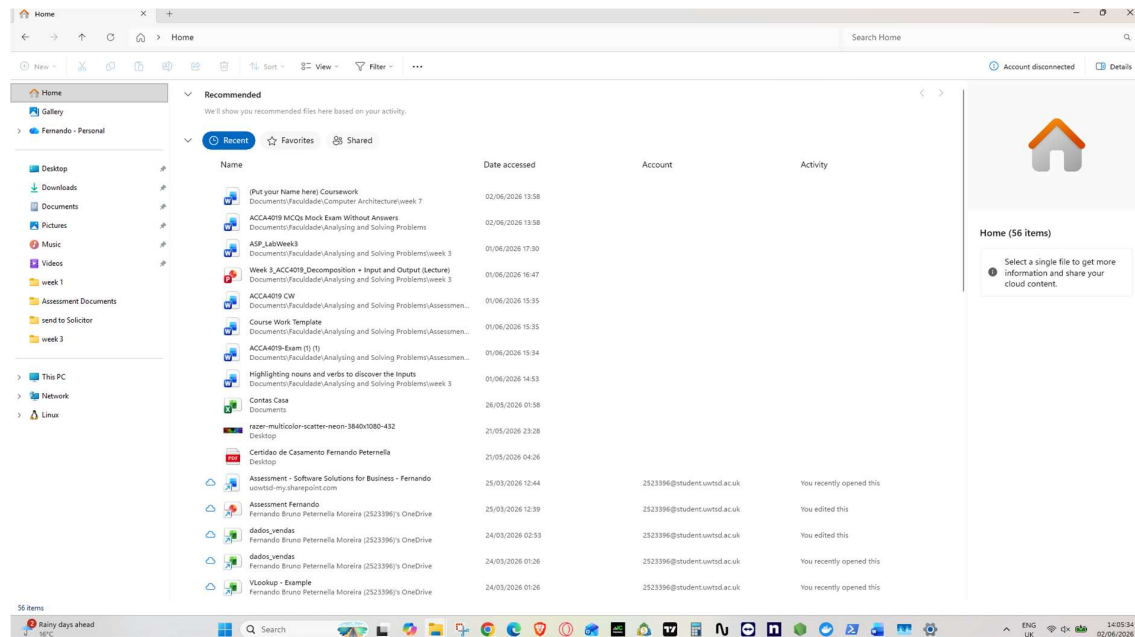


Figure 3: File Explorer, Home view

Device Management:

Device management is how Windows control the hardware that is connect in the computer, like camera, keyboard, mouse, and network adapter. Windows use a tool call Device Manager to show all this devices and their drivers [6]. From Device Manager, user can check if device is working properly, update the driver, or disable it. Figure 4 shows Device Manager open, with Properties window of Integrated Camera, showing device type, manufacturer, and status. This tool help user to fix hardware problem and make sure every device is work correctly.

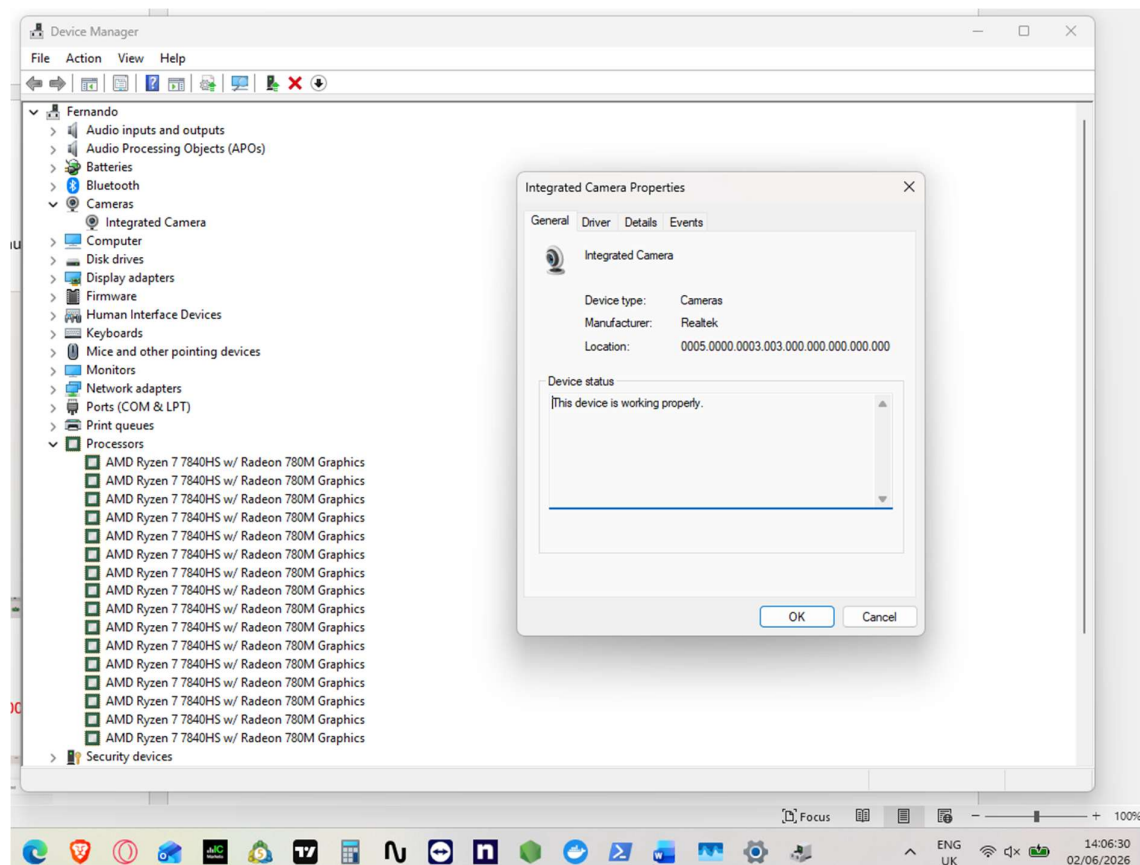


Figure 4: Device Manager

Security Management:

Is where you can protect computer from virus, unwanted access, and other threats. Windows have built-in tool call Windows Security, which include Microsoft Defender Antivirus and a firewall [7]. This features can be reach from Settings app, under Privacy & security. Figure 5 shows the Windows Settings app, from where user can reach System options and, through side menu, the security settings for device. Keep this settings updated is protect personal files and data from malware, and stop other people to access the computer without permission.

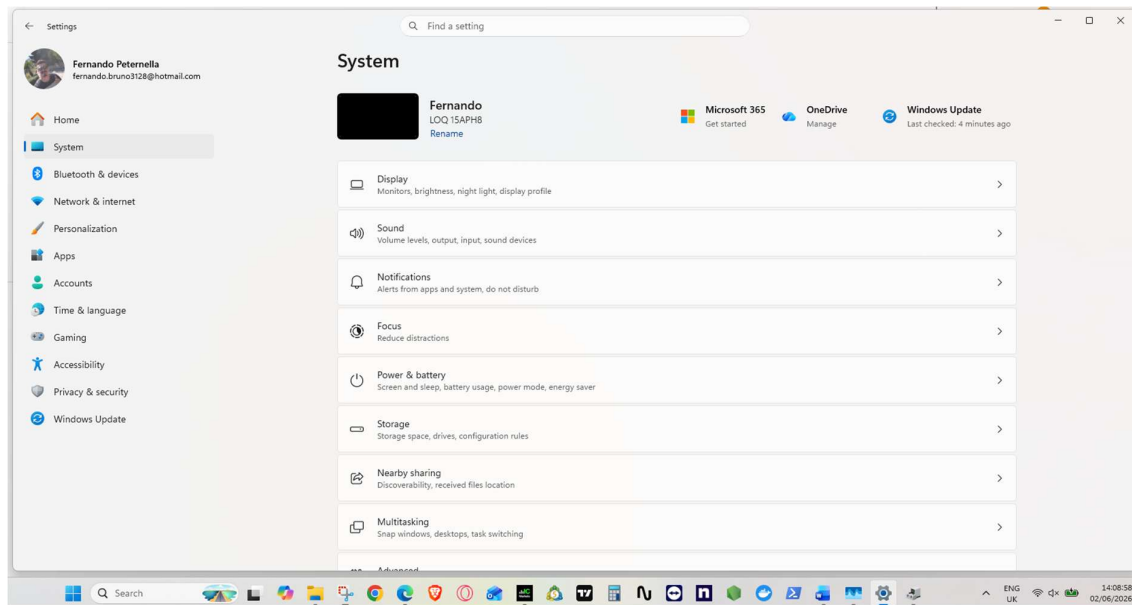


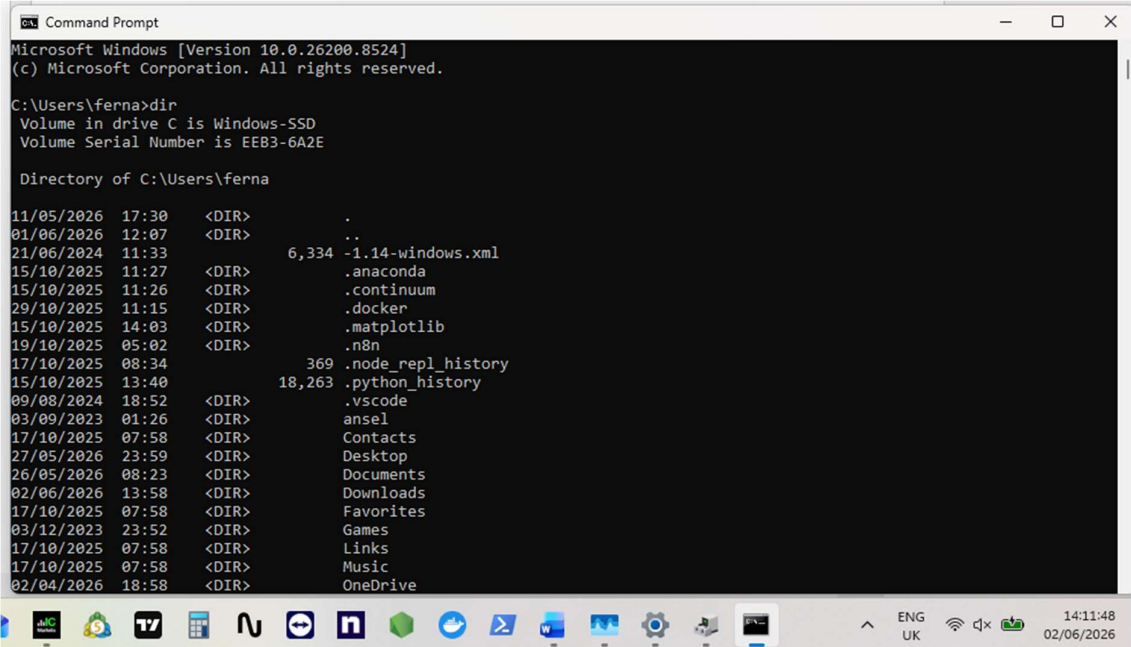
Figure 5: System page, Windows Settings.

Use of Windows OS CLI commands

The (CLI) is let users to control Windows by typing commands, instead of clicking icons. Windows use Command Prompt to run this commands [8]. The ten example below is cover some area as list bellow.

Example 1:

The `dir` command is list the files and folders inside a directory. Figure 6 shows the output of `dir` in C:\Users\ferna, with folders like Desktop, Documents and Downloads, and their creation date and type.



```
Microsoft Windows [Version 10.0.26200.8524]
(c) Microsoft Corporation. All rights reserved.

C:\Users\ferna>dir
Volume in drive C is Windows-SSD
Volume Serial Number is EEB3-6A2E

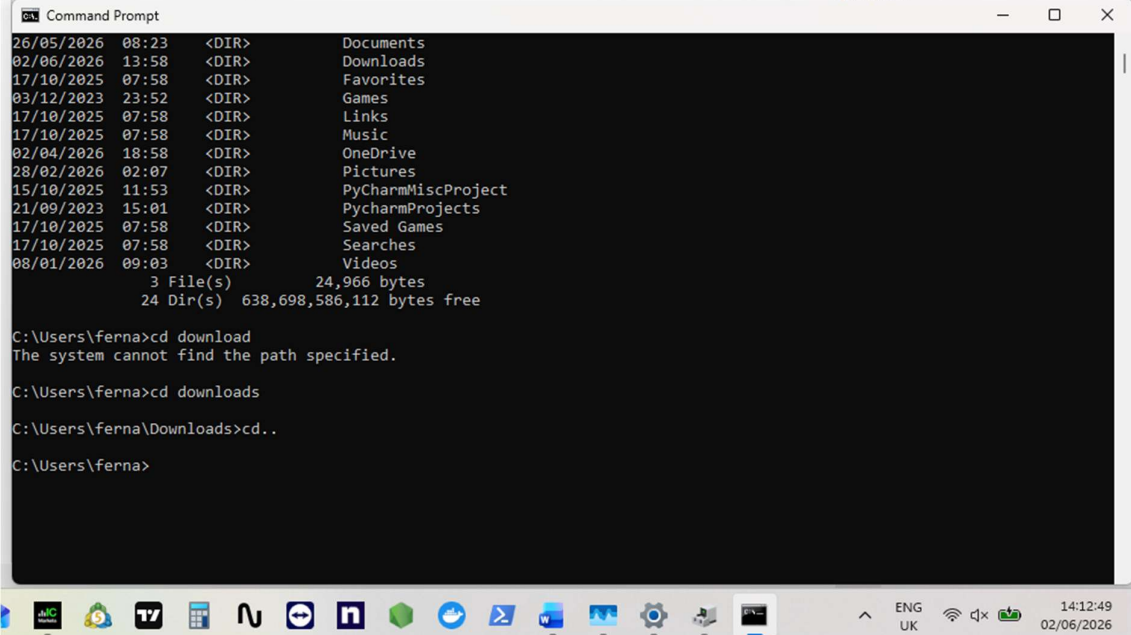
Directory of C:\Users\ferna

11/05/2026  17:30    <DIR>          .
01/06/2026  12:07    <DIR>          ..
21/06/2024  11:33             6,334  -1.14-windows.xml
15/10/2025  11:27    <DIR>          .anaconda
15/10/2025  11:26    <DIR>          .continuum
29/10/2025  11:15    <DIR>          .docker
15/10/2025  14:03    <DIR>          .matplotlib
19/10/2025  05:02    <DIR>          .n8n
17/10/2025  08:34             369  .node_repl_history
15/10/2025  13:40            18,263  .python_history
09/08/2024  18:52    <DIR>          .vscode
03/09/2023  01:26    <DIR>          .ansel
17/10/2025  07:58    <DIR>          Contacts
27/05/2026  23:59    <DIR>          Desktop
26/05/2026  08:23    <DIR>          Documents
02/06/2026  13:58    <DIR>          Downloads
17/10/2025  07:58    <DIR>          Favorites
03/12/2023  23:52    <DIR>          Games
17/10/2025  07:58    <DIR>          Links
17/10/2025  07:58    <DIR>          Music
02/04/2026  18:58    <DIR>          OneDrive
```

Figure 6: dir command listing files and folders

Example 2:

The `cd` command is change the directory. Figure 7 shows a error when the folder name is wrong (download), and success when the correct name is use (downloads). The command `cd ..` is move back to the parent folder.



```
Command Prompt
26/05/2026 08:23 <DIR> Documents
02/06/2026 13:58 <DIR> Downloads
17/10/2025 07:58 <DIR> Favorites
03/12/2023 23:52 <DIR> Games
17/10/2025 07:58 <DIR> Links
17/10/2025 07:58 <DIR> Music
02/04/2026 18:58 <DIR> OneDrive
28/02/2026 02:07 <DIR> Pictures
15/10/2025 11:53 <DIR> PyCharmMiscProject
21/09/2023 15:01 <DIR> PyCharmProjects
17/10/2025 07:58 <DIR> Saved Games
17/10/2025 07:58 <DIR> Searches
08/01/2026 09:03 <DIR> Videos
3 File(s) 24,966 bytes
24 Dir(s) 638,698,586,112 bytes free

C:\Users\ferna>cd download
The system cannot find the path specified.

C:\Users\ferna>cd downloads

C:\Users\ferna\Downloads>cd..

C:\Users\ferna>
```

Figure 7: cd command changing directory

Example 3:

The `ipconfig` command showed the network configuration of the computer. Figure 8 shows the IP address and default gateway for the Wi-Fi connection, after run `ipconfig` and `ipconfig /all`.

```
C:\Users\ferna\Downloads>ipconfig

Windows IP Configuration

Ethernet adapter Ethernet:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . : powerhub

Wireless LAN adapter Local Area Connection* 1:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Local Area Connection* 2:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

Wireless LAN adapter Wi-Fi:

    Connection-specific DNS Suffix  . : uni.local
    Link-local IPv6 Address . . . . . : fe80::d945:32a4:20f7:1381%8
    IPv4 Address. . . . . : 10.38.210.115
    Subnet Mask . . . . . : 255.255.252.0
    Default Gateway . . . . . : 10.38.208.1

Ethernet adapter Bluetooth Network Connection:

    Media State . . . . . : Media disconnected
    Connection-specific DNS Suffix  . :

C:\Users\ferna\Downloads>ipconfig /all

Windows IP Configuration
```

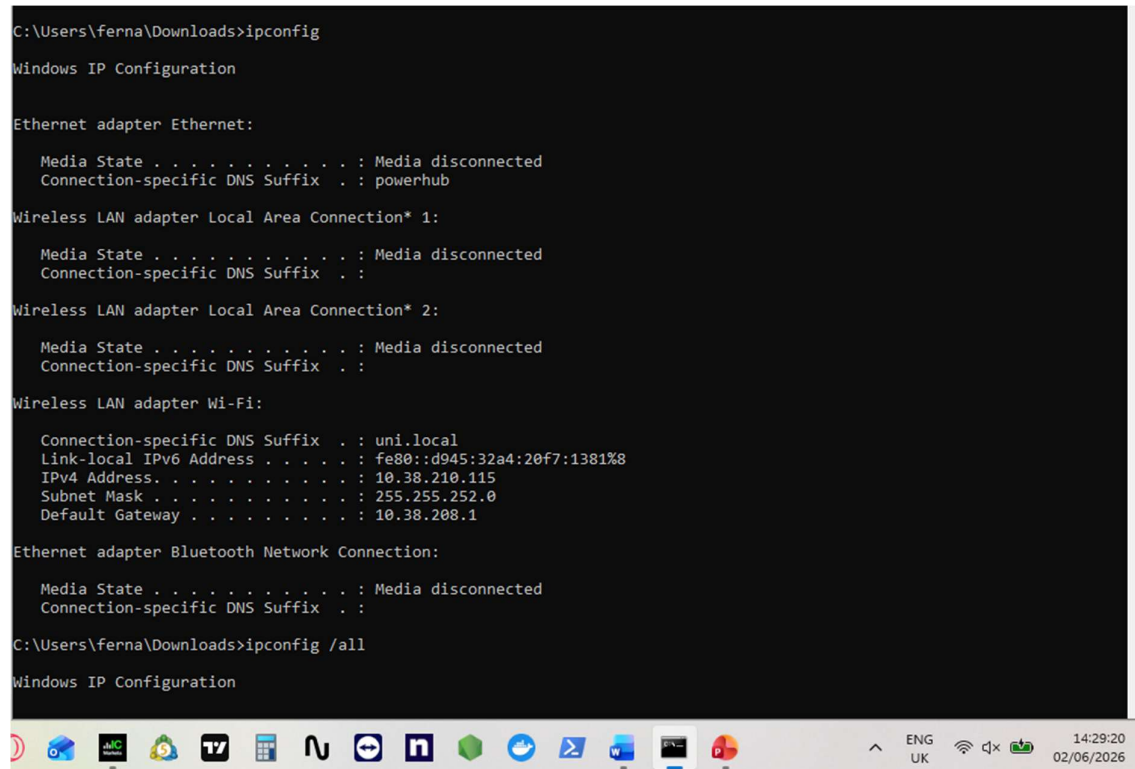
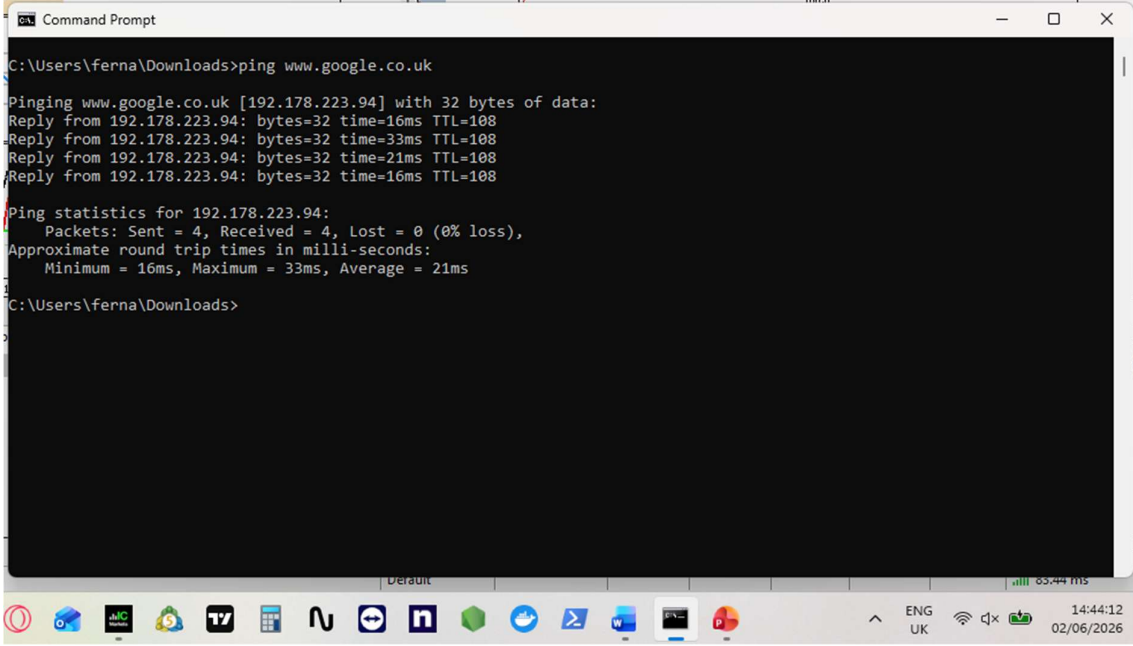


Figure 8: *ipconfig* command showing network configuration

Example 4:

The `ping` command is test the connection to another computer. Figure 9 shows a ping to www.google.co.uk, with the reply time (RTT) and Time to Live (TTL) for each of the four packet sent.



```
Command Prompt

C:\Users\ferna\Downloads>ping www.google.co.uk

Pinging www.google.co.uk [192.178.223.94] with 32 bytes of data:
Reply from 192.178.223.94: bytes=32 time=16ms TTL=108
Reply from 192.178.223.94: bytes=32 time=33ms TTL=108
Reply from 192.178.223.94: bytes=32 time=21ms TTL=108
Reply from 192.178.223.94: bytes=32 time=16ms TTL=108

Ping statistics for 192.178.223.94:
    Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
    Approximate round trip times in milli-seconds:
        Minimum = 16ms, Maximum = 33ms, Average = 21ms

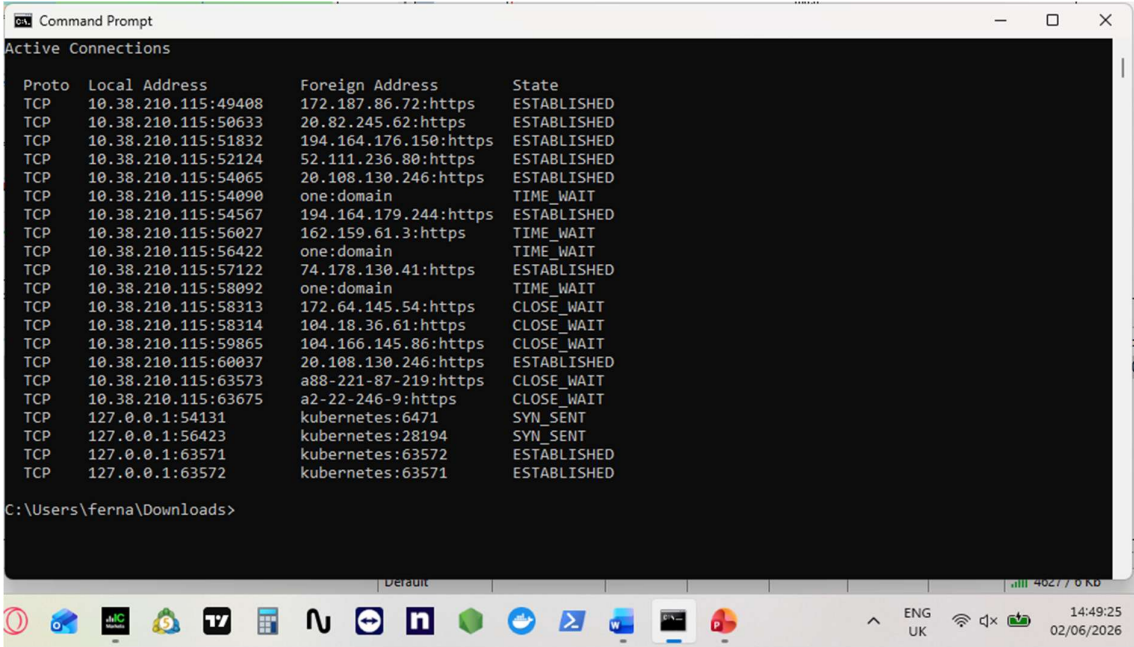
C:\Users\ferna\Downloads>
```

The screenshot shows a Windows Command Prompt window with a black background and white text. The title bar reads 'Command Prompt'. The command prompt shows the execution of the 'ping www.google.co.uk' command. The output displays four successful replies from the IP address 192.178.223.94, each with 32 bytes of data. The round trip times (RTT) are 16ms, 33ms, 21ms, and 16ms, all with a TTL of 108. The ping statistics summary shows 4 packets sent and received, 0% loss, and an average round trip time of 21ms. The taskbar at the bottom shows various application icons and the system clock indicating 14:44:12 on 02/06/2026.

Figure 9: ping command

Example 5:

The `netstat` command is list the active network connections of the computer. Figure 10 shows several TCP connections, their local and foreign address, and their state, like ESTABLISHED, TIME_WAIT or CLOSE_WAIT.

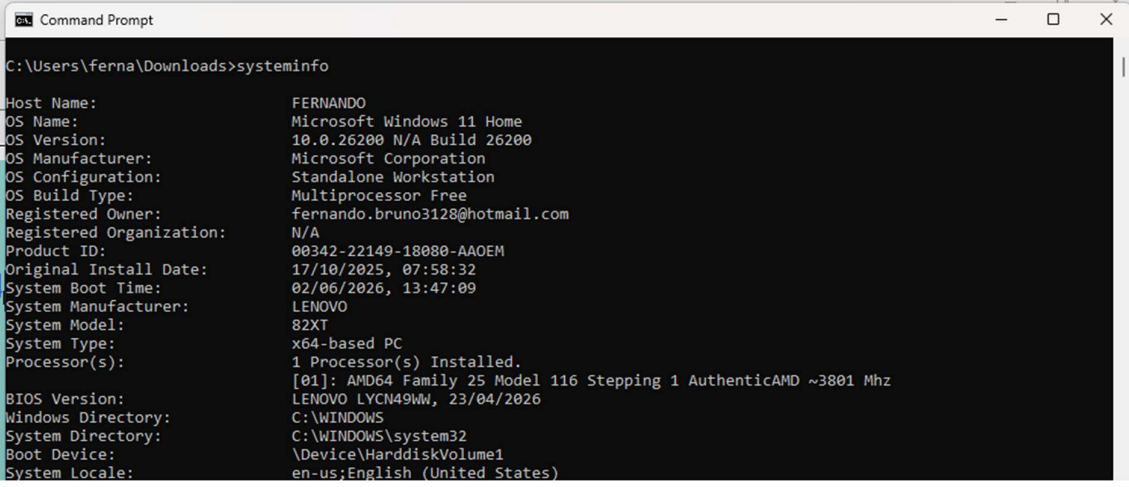


```
Command Prompt
Active Connections
Proto Local Address Foreign Address State
TCP 10.38.210.115:49408 172.187.86.72:https ESTABLISHED
TCP 10.38.210.115:50633 20.82.245.62:https ESTABLISHED
TCP 10.38.210.115:51832 194.164.176.150:https ESTABLISHED
TCP 10.38.210.115:52124 52.111.236.80:https ESTABLISHED
TCP 10.38.210.115:54065 20.108.130.246:https ESTABLISHED
TCP 10.38.210.115:54090 one:domain TIME_WAIT
TCP 10.38.210.115:54567 194.164.179.244:https ESTABLISHED
TCP 10.38.210.115:56027 162.159.61.3:https TIME_WAIT
TCP 10.38.210.115:56422 one:domain TIME_WAIT
TCP 10.38.210.115:57122 74.178.130.41:https ESTABLISHED
TCP 10.38.210.115:58092 one:domain TIME_WAIT
TCP 10.38.210.115:58313 172.64.145.54:https CLOSE_WAIT
TCP 10.38.210.115:58314 104.18.36.61:https CLOSE_WAIT
TCP 10.38.210.115:59865 104.166.145.86:https CLOSE_WAIT
TCP 10.38.210.115:60037 20.108.130.246:https ESTABLISHED
TCP 10.38.210.115:63573 a88-221-87-219:https CLOSE_WAIT
TCP 10.38.210.115:63675 a2-22-246-9:https CLOSE_WAIT
TCP 127.0.0.1:54131 kubernetes:6471 SYN_SENT
TCP 127.0.0.1:56423 kubernetes:28194 SYN_SENT
TCP 127.0.0.1:63571 kubernetes:63572 ESTABLISHED
TCP 127.0.0.1:63572 kubernetes:63571 ESTABLISHED
C:\Users\ferna\Downloads>
```

Figure 10: netstat command showing connections

Example 6:

The `systeminfo` command is show detailed information about the device. Figure 11 shows the host name, OS version, manufacturer, and other detail of the computer, useful to check the system specification.



```
Command Prompt
C:\Users\ferna\Downloads>systeminfo

Host Name:                               FERNANDO
OS Name:                                  Microsoft Windows 11 Home
OS Version:                              10.0.26200 N/A Build 26200
OS Manufacturer:                         Microsoft Corporation
OS Configuration:                       Standalone Workstation
OS Build Type:                            Multiprocessor Free
Registered Owner:                         fernando.bruno3128@hotmail.com
Registered Organization:                  N/A
Product ID:                              00342-22149-18080-AAOEM
Original Install Date:                    17/10/2025, 07:58:32
System Boot Time:                         02/06/2026, 13:47:09
System Manufacturer:                     LENOVO
System Model:                             82XT
System Type:                             x64-based PC
Processor(s):                             1 Processor(s) Installed.
                                           [01]: AMD64 Family 25 Model 116 Stepping 1 AuthenticAMD ~3801 Mhz
BIOS Version:                             LENOVO LYCN49WW, 23/04/2026
Windows Directory:                       C:\WINDOWS
System Directory:                         C:\WINDOWS\system32
Boot Device:                             \Device\HarddiskVolume1
System Locale:                             en-us;English (United States)
```

Figure 11: systeminfo command showing device information

Example 7:

The 'tasklist' command is list all the process that is running in the computer. Figure 12 shows each process name, its Process ID (PID), and how much memory it is using, similar like Task Manager.

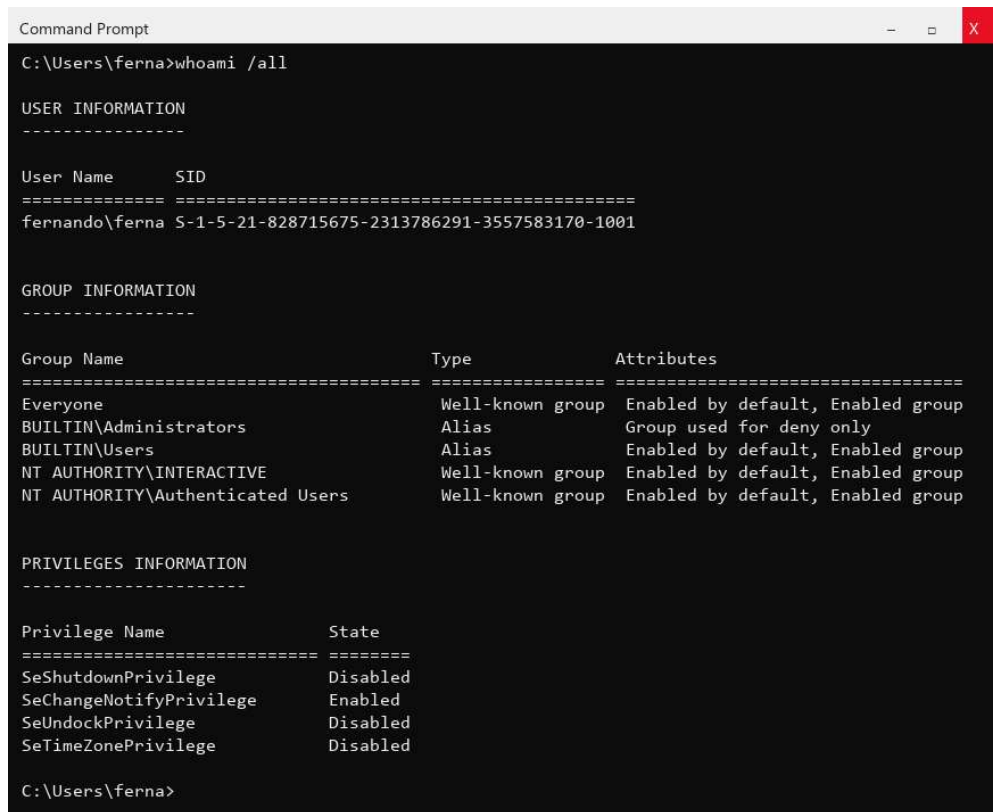
```
C:\Users\Ferna\Downloads>tasklist

Image Name                   PID Session Name        Session#    Mem Usage
-----
System Idle Process          0 Services              0             8 K
System                        4 Services              0          2,276 K
Secure System                236 Services              0         71,836 K
lsass.exe                    288 Services              0         57,628 K
smss.exe                      876 Services              0         1,592 K
svchost.exe                   124 Services              0          6,780 K
wininit.exe                  1632 Services              0          8,972 K
csrss.exe                     1640 Services              0          7,280 K
winlogon.exe                 1728 Console                1         15,832 K
services.exe                 1748 Services              0          19,344 K
lsass.exe                    1792 Services              0           3,968 K
lsass.exe                     1804 Services              0         34,908 K
svchost.exe                   1924 Services              0         12,580 K
fontdrvhost.exe              1944 Console                1          7,228 K
fontdrvhost.exe              1952 Services              0           3,780 K
svchost.exe                   856 Services              0         20,940 K
svchost.exe                   1408 Services              0           7,080 K
svchost.exe                   1776 Services              0         13,016 K
svchost.exe                   2088 Services              0           7,348 K
dum.exe                       2168 Console                1        132,436 K
svchost.exe                   2268 Services              0           9,224 K
svchost.exe                   2268 Services              0           6,648 K
svchost.exe                   2320 Services              0         13,944 K
svchost.exe                   2328 Services              0         10,516 K
svchost.exe                   2336 Services              0         20,384 K
svchost.exe                   2344 Services              0         19,872 K
svchost.exe                   2556 Services              0         10,784 K
svchost.exe                   2620 Services              0         13,640 K
svchost.exe                   2616 Services              0         13,540 K
svchost.exe                   2628 Services              0         15,580 K
svchost.exe                   2704 Services              0         16,628 K
svchost.exe                   2780 Services              0         12,372 K
svchost.exe                   2880 Services              0         17,748 K
svchost.exe                   2888 Services              0         11,040 K
svchost.exe                   2932 Services              0          7,424 K
svchost.exe                   2964 Services              0          7,712 K
svchost.exe                   3020 Services              0         21,080 K
svchost.exe                   3040 Services              0         10,216 K
svchost.exe                   3108 Services              0          8,116 K
svchost.exe                   3528 Services              0         10,364 K
svchost.exe                   3076 Services              0         13,506 K
svchost.exe                   3452 Services              0         20,798 K
svchost.exe                   3840 Services              0           9,812 K
PwmapiPrvse.exe              3612 Services              0         40,944 K
NVIDIAContainer.exe          3816 Services              0         10,580 K
svchost.exe                   4144 Services              0         11,356 K
amdfeedrpr.exe               4188 Services              0          9,100 K
atiles.exe                   4196 Services              0          8,628 K
svchost.exe                   4360 Services              0         18,316 K
NVIDIAContainer.exe          4368 Services              0         12,084 K
NVIDIAContainer.exe          4568 Console                1         40,144 K
nvcl.exe                      4780 Console                1         20,064 K
svchost.exe                   4708 Services              0         11,012 K
svchost.exe                   4716 Services              0          7,652 K
svchost.exe                   4724 Services              0         19,716 K
svchost.exe                   4820 Services              0         11,300 K
```

Figure 12: tasklist command showing running processes

Example 8:

The ``whoami /all`` command is show detail about the user that is logged in now, including group membership and privileges. This is a user management command. Figure 31 shows the user name, SID, the groups that account belong, like Administrators, and privileges like SeShutdownPrivilege, and if each one is enable or disable [8].



```
Command Prompt
C:\Users\ferna>whoami /all

USER INFORMATION
-----

User Name      SID
=====
fernando\ferna S-1-5-21-828715675-2313786291-3557583170-1001

GROUP INFORMATION
-----

Group Name      Type      Attributes
=====
Everyone        Well-known group  Enabled by default, Enabled group
BUILTIN\Administrators Alias        Group used for deny only
BUILTIN\Users   Alias        Enabled by default, Enabled group
NT AUTHORITY\INTERACTIVE Well-known group  Enabled by default, Enabled group
NT AUTHORITY\Authenticated Users Well-known group  Enabled by default, Enabled group

PRIVILEGES INFORMATION
-----

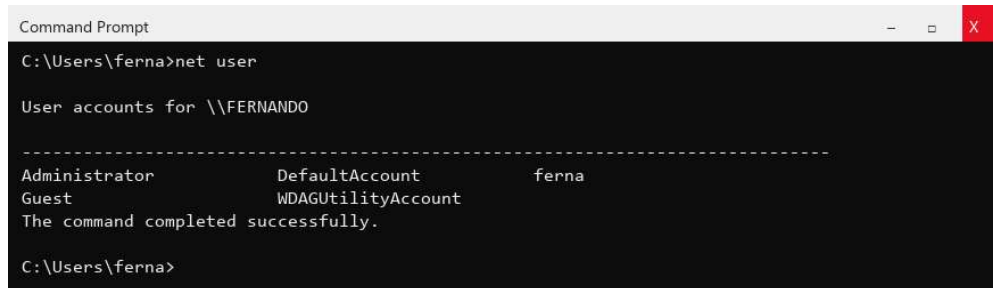
Privilege Name      State
=====
SeShutdownPrivilege Disabled
SeChangeNotifyPrivilege Enabled
SeUndockPrivilege   Disabled
SeTimeZonePrivilege Disabled

C:\Users\ferna>
```

Figure 31: `whoami /all` command showing user, groups and privileges

Example 9:

The `net user` command is list all local user account in the computer. This is also user management command. Figure 32 shows the accounts in this machine: Administrator, DefaultAccount, ferna, Guest and WDAGUtilityAccount, is useful to check who have access to the device [8].



```
Command Prompt
C:\Users\ferna>net user

User accounts for \\FERNANDO

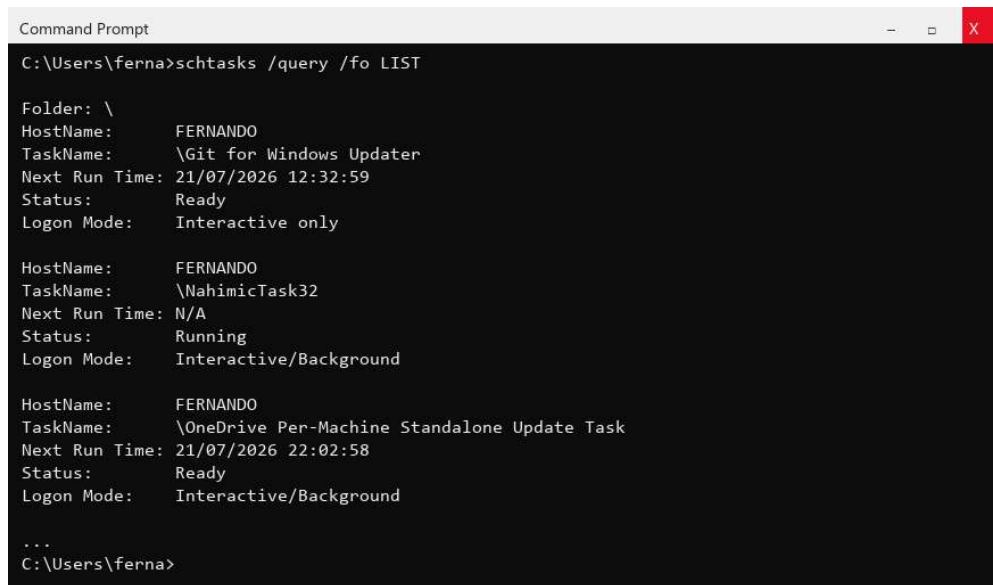
-----
Administrator      DefaultAccount      ferna
Guest              WDAGUtilityAccount
The command completed successfully.

C:\Users\ferna>
```

Figure 32: net user command listing local user accounts

Example 10:

The `schtasks /query` command is list the tasks that is scheduled to run automatic in Windows. This is task scheduling command. Figure 33 shows some scheduled task, their next run time, and their status, like "Git for Windows Updater", showing how Windows automate routine job without user action [12].



```
Command Prompt
C:\Users\ferna>schtasks /query /fo LIST

Folder: \
HostName:      FERNANDO
TaskName:      \Git for Windows Updater
Next Run Time: 21/07/2026 12:32:59
Status:        Ready
Logon Mode:    Interactive only

HostName:      FERNANDO
TaskName:      \NahimicTask32
Next Run Time: N/A
Status:        Running
Logon Mode:    Interactive/Background

HostName:      FERNANDO
TaskName:      \OneDrive Per-Machine Standalone Update Task
Next Run Time: 21/07/2026 22:02:58
Status:        Ready
Logon Mode:    Interactive/Background

...
C:\Users\ferna>
```

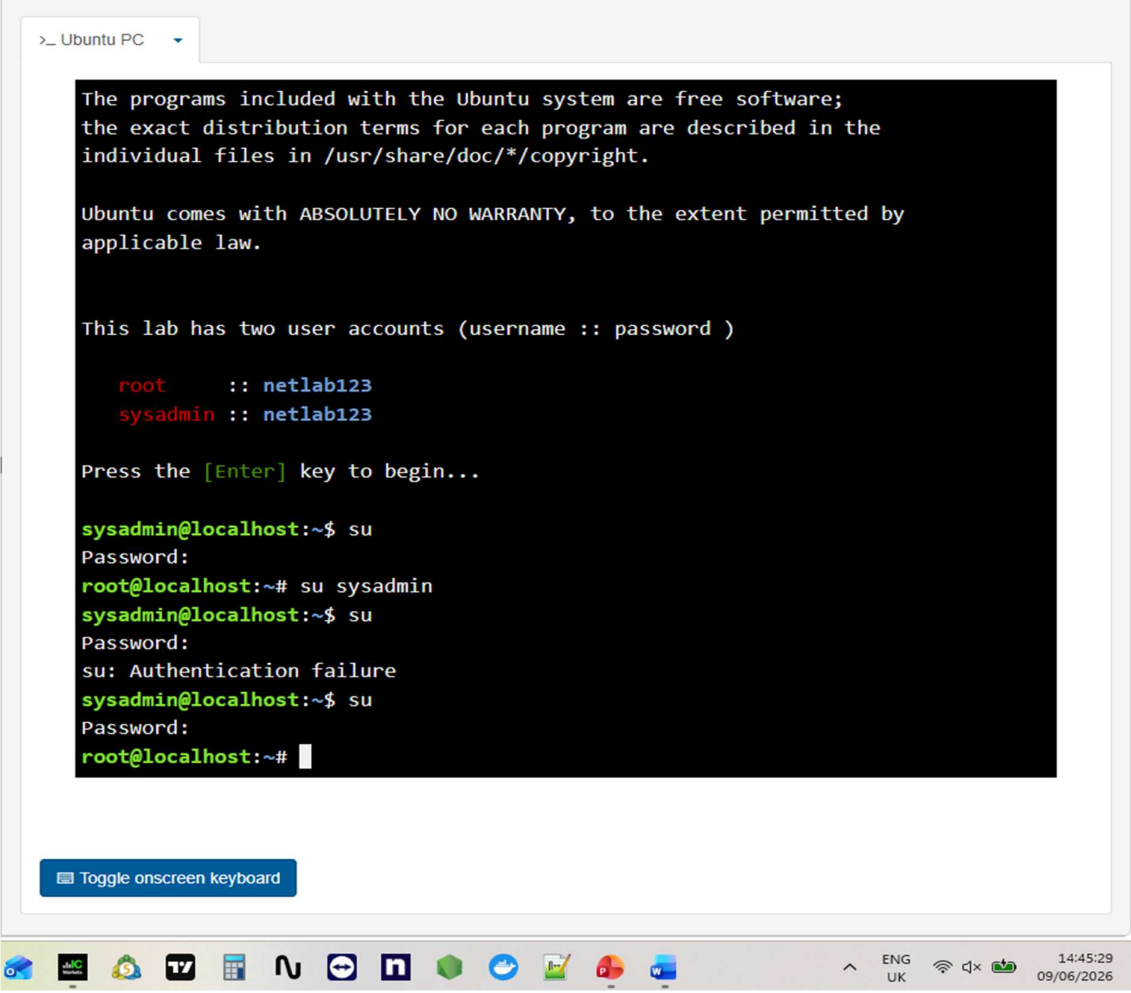
Figure 33: schtasks /query command listing scheduled tasks

Use of Linux OS - CLI commands

Linux also have a Command Line Interface, call terminal or shell. It let users to manage files, check the network, and control the system by typing commands [9]. The example below is cover file and directory management, network testing, and user management.

Example 1:

The `su` command is switch to another user account. Figure 13 shows the user log in as sysadmin, then use `su` to become root, with one fail attempt (wrong password) before the correct login.



```
>_ Ubuntu PC

The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

This lab has two user accounts (username :: password )

root      :: netlab123
sysadmin   :: netlab123

Press the [Enter] key to begin...

sysadmin@localhost:~$ su
Password:
root@localhost:~# su sysadmin
sysadmin@localhost:~$ su
Password:
su: Authentication failure
sysadmin@localhost:~$ su
Password:
root@localhost:~#
```

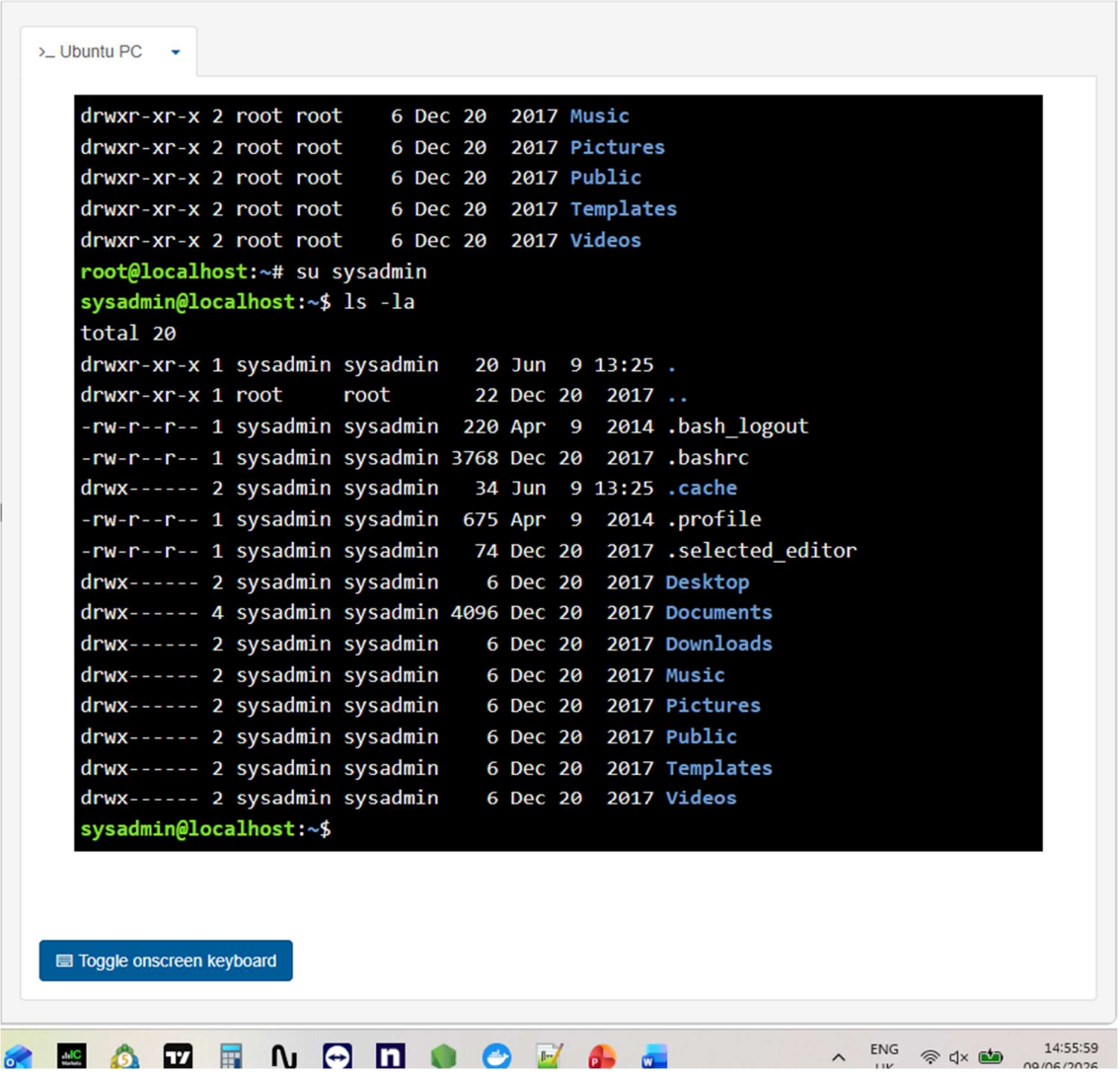
Toggle onscreen keyboard

ENG UK 14:45:29 09/06/2026

Figure 13: su command switching user

Example 2:

The `ls -la` command is list all files in a directory, include the hidden one, with detail like permission and owner. Figure 14 shows the home folder of sysadmin, with files like .bashrc and folders like Desktop.



The screenshot shows a terminal window titled ">_ Ubuntu PC". The user is initially at the root prompt, then switches to the sysadmin user using 'su sysadmin'. The sysadmin user then runs 'ls -la' in their home directory. The output lists various files and directories with their permissions, owners, sizes, and timestamps. The files include .bash_logout, .bashrc, .cache, .profile, .selected_editor, Desktop, Documents, Downloads, Music, Pictures, Public, Templates, and Videos. The terminal window is overlaid on a desktop environment with a taskbar at the bottom showing various application icons and system status indicators.

```
>_ Ubuntu PC
drwxr-xr-x 2 root root    6 Dec 20 2017 Music
drwxr-xr-x 2 root root    6 Dec 20 2017 Pictures
drwxr-xr-x 2 root root    6 Dec 20 2017 Public
drwxr-xr-x 2 root root    6 Dec 20 2017 Templates
drwxr-xr-x 2 root root    6 Dec 20 2017 Videos
root@localhost:~# su sysadmin
sysadmin@localhost:~$ ls -la
total 20
drwxr-xr-x 1 sysadmin sysadmin  20 Jun  9 13:25 .
drwxr-xr-x 1 root     root      22 Dec 20 2017 ..
-rw-r--r-- 1 sysadmin sysadmin 220 Apr  9 2014 .bash_logout
-rw-r--r-- 1 sysadmin sysadmin 3768 Dec 20 2017 .bashrc
drwx----- 2 sysadmin sysadmin  34 Jun  9 13:25 .cache
-rw-r--r-- 1 sysadmin sysadmin  675 Apr  9 2014 .profile
-rw-r--r-- 1 sysadmin sysadmin   74 Dec 20 2017 .selected_editor
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Desktop
drwx----- 4 sysadmin sysadmin 4096 Dec 20 2017 Documents
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Downloads
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Music
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Pictures
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Public
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Templates
drwx----- 2 sysadmin sysadmin   6 Dec 20 2017 Videos
sysadmin@localhost:~$
```

Figure 14: ls -la command listing files

Example 3:

The `cd` command is change the current directory. Figure 15 shows the command `cd Desktop/`, which move the user from home folder into the Desktop folder, show by the change in prompt.

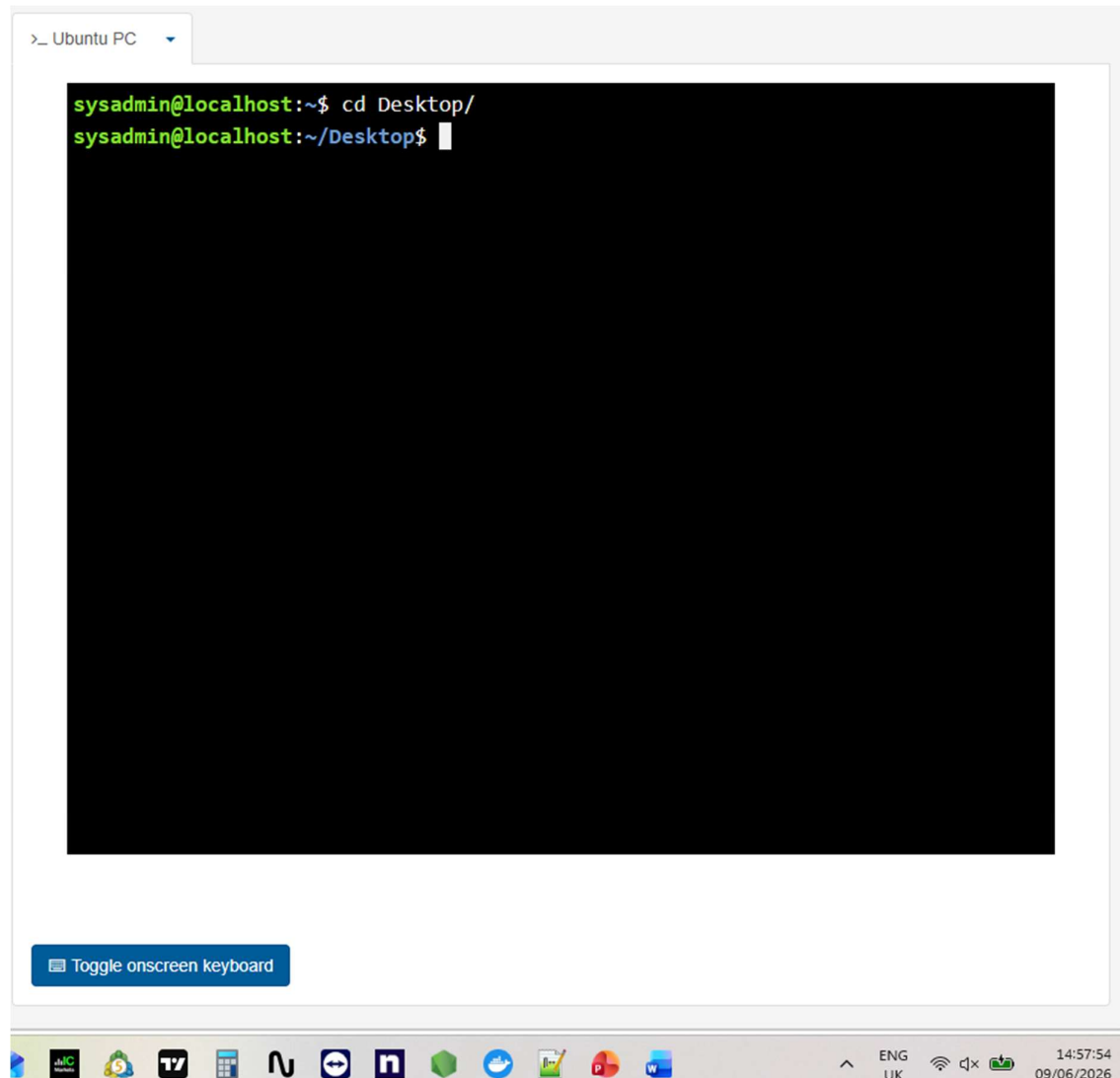
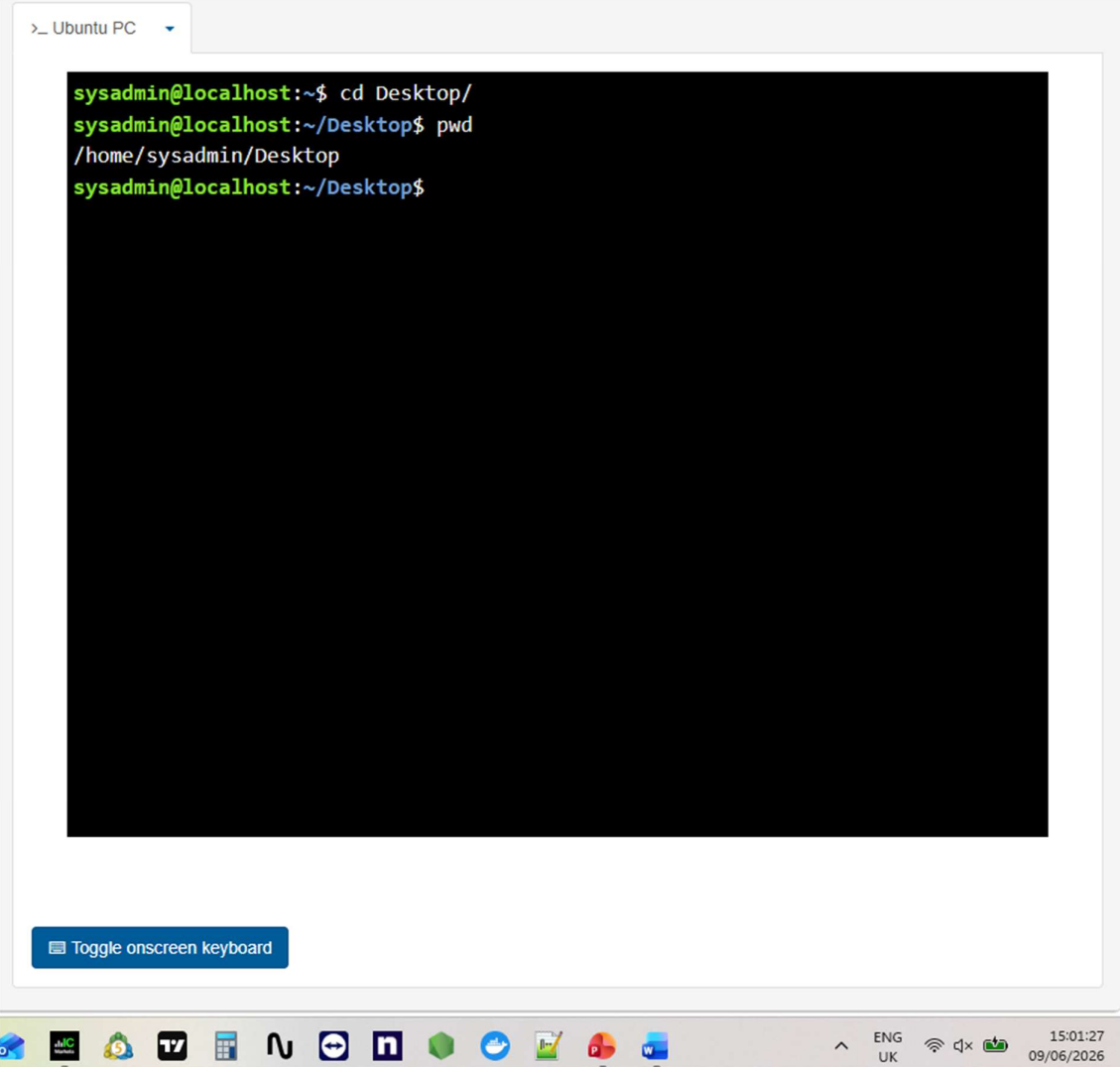


Figure 15: cd command changing to the Desktop folder

Example 4:

The `pwd` command is print the full path of the directory. Figure 16 shows the output `/home/sysadmin/Desktop`, confirm the user is inside Desktop folder.

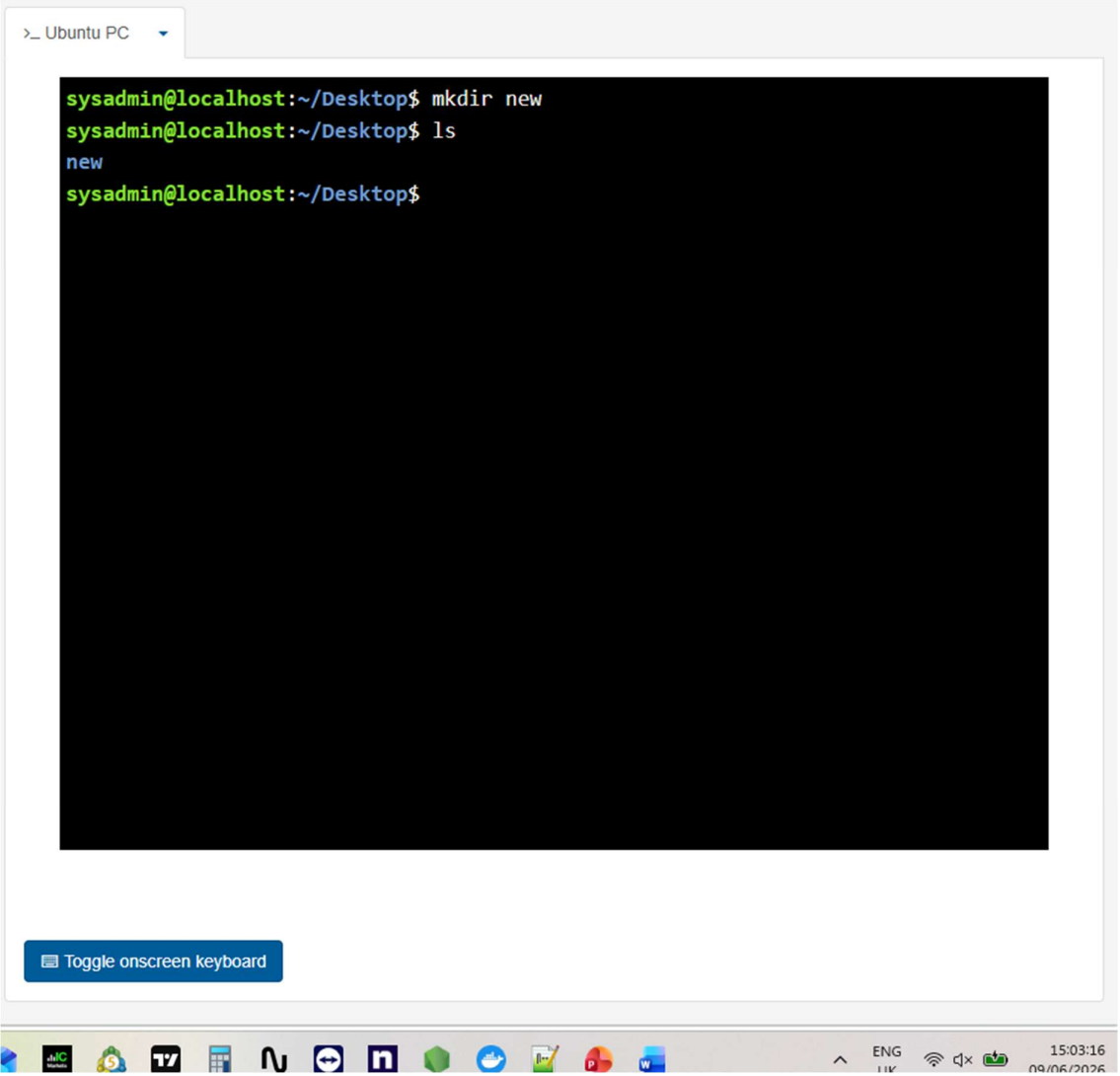
A screenshot of a terminal window titled "Ubuntu PC". The terminal shows a user named sysadmin at localhost. The user enters the command "cd Desktop/" and then "pwd". The output of the pwd command is "/home/sysadmin/Desktop". The terminal window has a dark background with light green text. Below the terminal window, there is a button labeled "Toggle onscreen keyboard". At the bottom of the screen, there is a taskbar with various application icons and system status indicators including language (ENG UK), network, and battery status, along with the time 15:01:27 and date 09/06/2026.

```
sysadmin@localhost:~$ cd Desktop/  
sysadmin@localhost:~/Desktop$ pwd  
/home/sysadmin/Desktop  
sysadmin@localhost:~/Desktop$
```

Figure 16: pwd command showing the current directory

Example 5:

The `mkdir` command is used to create a new folder. Figure 17 shows the command `mkdir new`, followed by `ls`, which confirms the new folder was created inside the Desktop directory.



The image shows a terminal window titled ">_ Ubuntu PC". The terminal output is as follows:

```
sysadmin@localhost:~/Desktop$ mkdir new
sysadmin@localhost:~/Desktop$ ls
new
sysadmin@localhost:~/Desktop$
```

Below the terminal window, there is a button labeled "Toggle onscreen keyboard". At the bottom of the screen, a taskbar is visible with various application icons and system status indicators, including the date and time "15:03:16 09/06/2026".

Figure 17: mkdir command creating a new folder

Example 6:

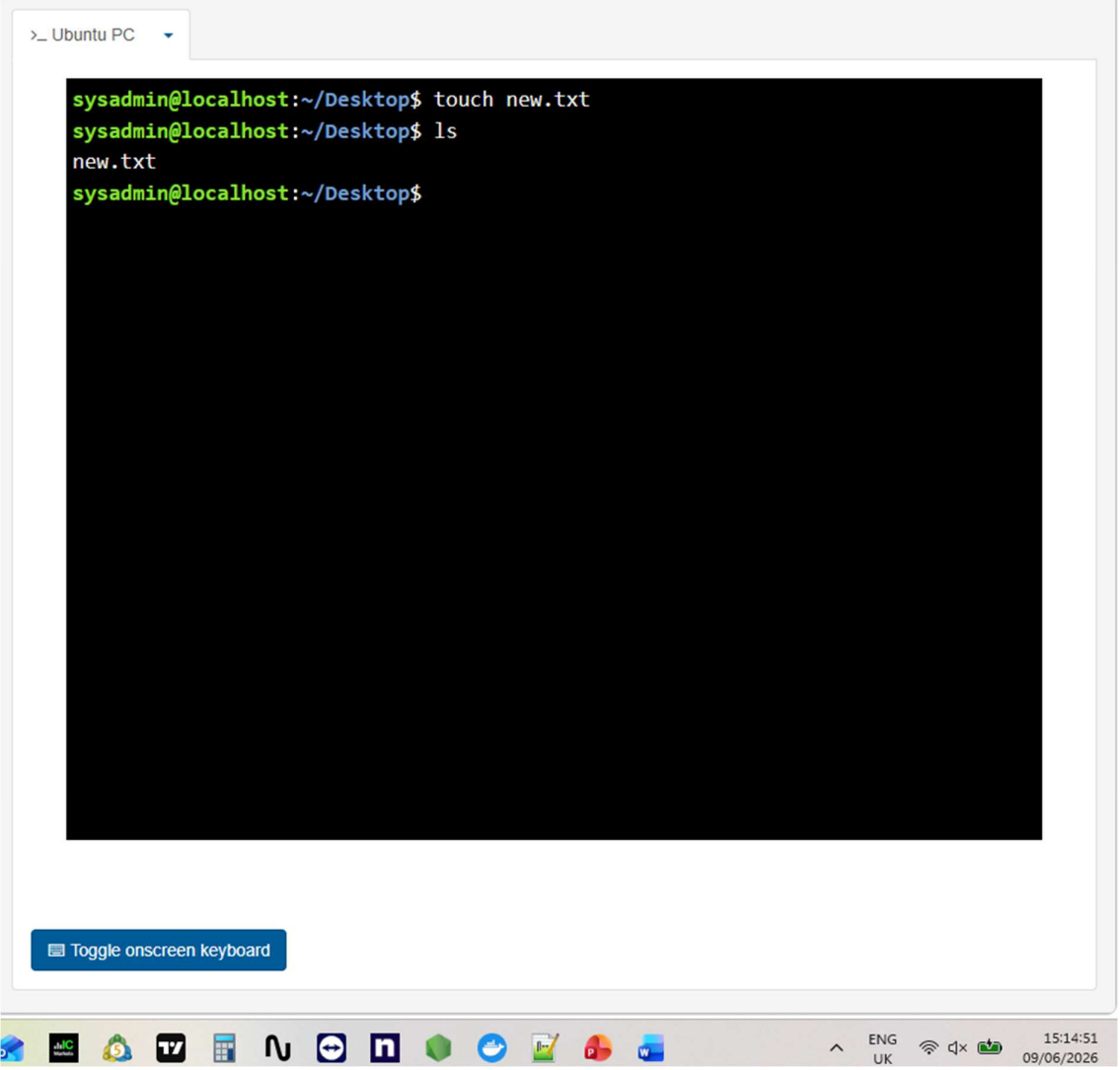
The ``rmdir`` command is delete a empty folder. Figure 18 shows the command ``rmdir new``, which remove the folder create before. Run ``ls`` after that show the folder is no more there.

```
sysadmin@localhost:~/Desktop$ rmdir new
sysadmin@localhost:~/Desktop$ ls
sysadmin@localhost:~/Desktop$
```

Figure 18: `rmdir` command deleting an empty folder

Example 7:

The `touch` command is used to create a new, empty file. Figure 19 shows the command `touch new.txt`, followed by `ls`, which shows the new file `new.txt` exists now in the Desktop folder.



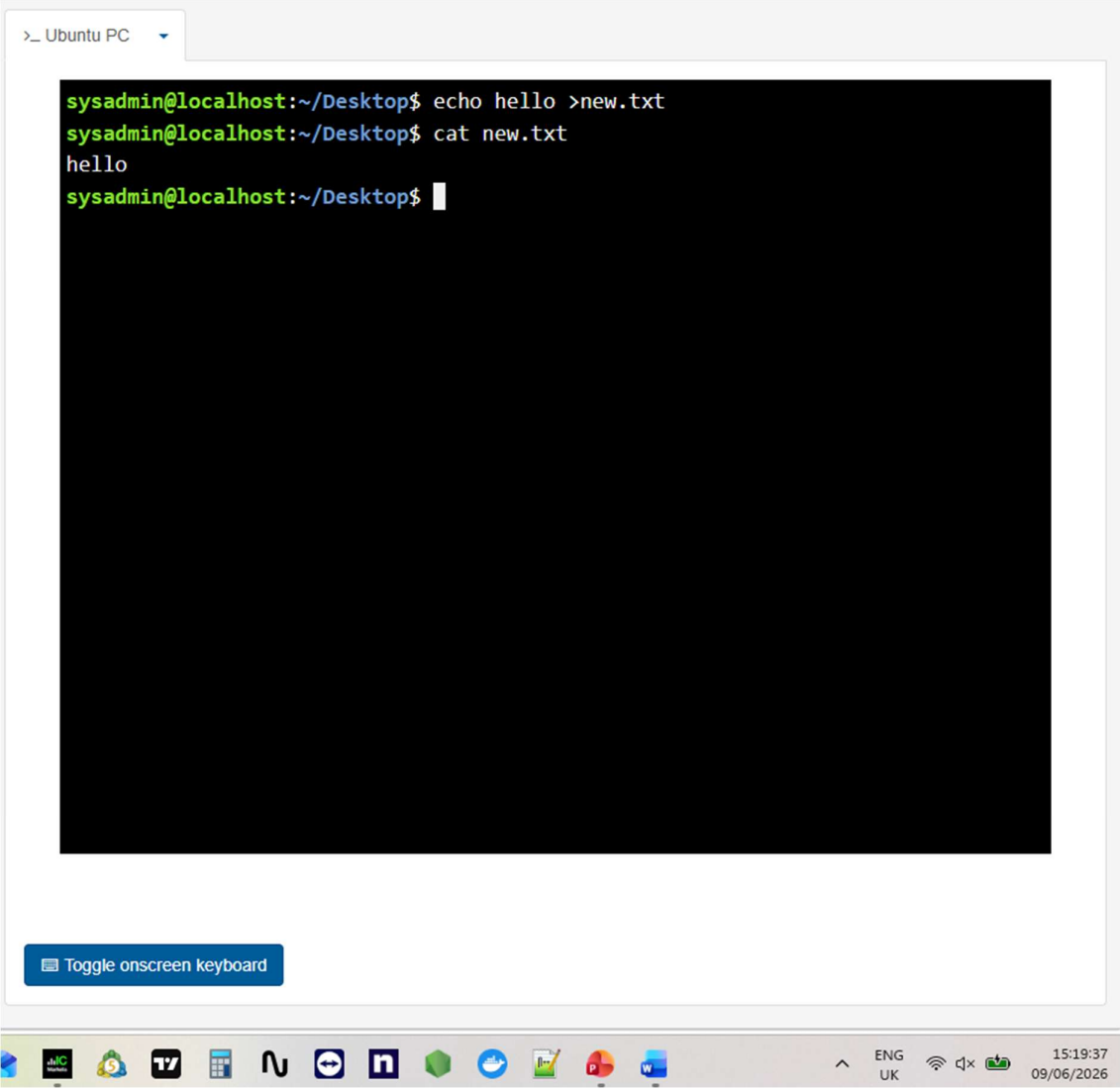
```
sysadmin@localhost:~/Desktop$ touch new.txt
sysadmin@localhost:~/Desktop$ ls
new.txt
sysadmin@localhost:~/Desktop$
```

The screenshot shows a terminal window titled ">_ Ubuntu PC". The terminal output shows the user 'sysadmin' at 'localhost' in the directory '~/Desktop'. They execute the command 'touch new.txt' to create a new file. Then, they execute 'ls' to list the directory contents, which shows 'new.txt'. The terminal window has a dark background with green and blue text. Below the terminal window is a button labeled 'Toggle onscreen keyboard'. At the bottom of the screen is a taskbar with various application icons and system status indicators, including the date and time '15:14:51 09/06/2026'.

Figure 19: touch command creating a new file

Example 8:

The `echo` command can write text into a file, and `cat` is show the content of a file. Figure 20 shows `echo hello >new.txt`, then `cat new.txt`, which print the word "hello".



The screenshot shows a terminal window titled ">_ Ubuntu PC". The terminal output is as follows:

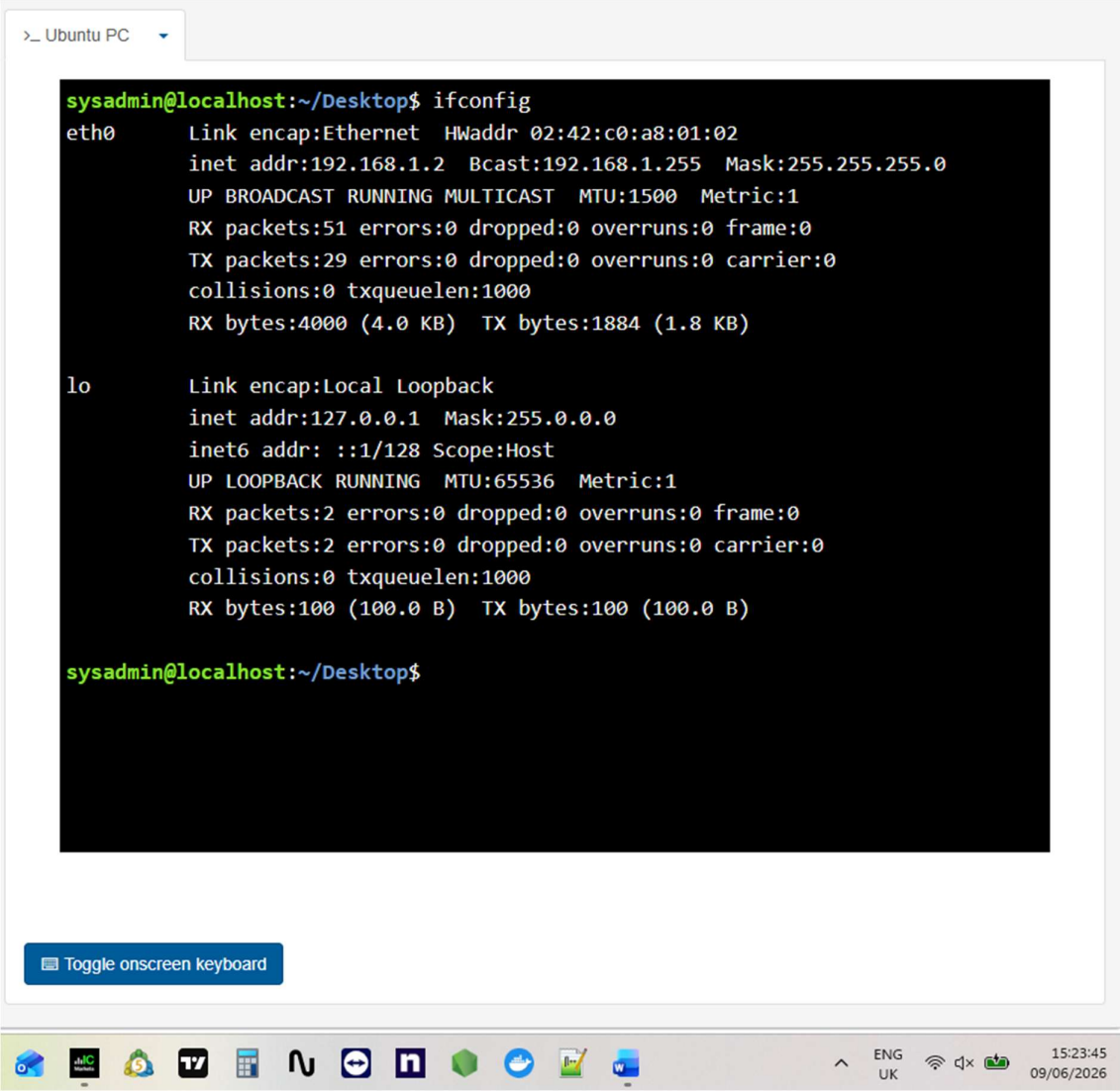
```
sysadmin@localhost:~/Desktop$ echo hello >new.txt
sysadmin@localhost:~/Desktop$ cat new.txt
hello
sysadmin@localhost:~/Desktop$
```

Below the terminal window, there is a button labeled "Toggle onscreen keyboard". At the bottom of the screen, a taskbar displays various application icons, including a file manager, LibreOffice, a media player, a calculator, a network icon, a terminal icon, a mail icon, a calendar icon, a power icon, and a volume icon. The system status bar on the right shows "ENG UK", signal strength, and the date and time "15:19:37 09/06/2026".

Figure 20: `echo` and `cat` commands writing and showing file content

Example 9:

The `ifconfig` command is used to show the network configuration of the Linux system. Figure 21 shows the IP address, MAC address and data packet for the eth0 and loopback (lo) network interface.



```
sysadmin@localhost:~/Desktop$ ifconfig
eth0      Link encap:Ethernet  HWaddr 02:42:c0:a8:01:02
          inet addr:192.168.1.2  Bcast:192.168.1.255  Mask:255.255.255.0
          UP BROADCAST RUNNING MULTICAST  MTU:1500  Metric:1
          RX packets:51 errors:0 dropped:0 overruns:0 frame:0
          TX packets:29 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:4000 (4.0 KB)  TX bytes:1884 (1.8 KB)

lo        Link encap:Local Loopback
          inet addr:127.0.0.1  Mask:255.0.0.0
          inet6 addr: ::1/128 Scope:Host
          UP LOOPBACK RUNNING  MTU:65536  Metric:1
          RX packets:2 errors:0 dropped:0 overruns:0 frame:0
          TX packets:2 errors:0 dropped:0 overruns:0 carrier:0
          collisions:0 txqueuelen:1000
          RX bytes:100 (100.0 B)  TX bytes:100 (100.0 B)

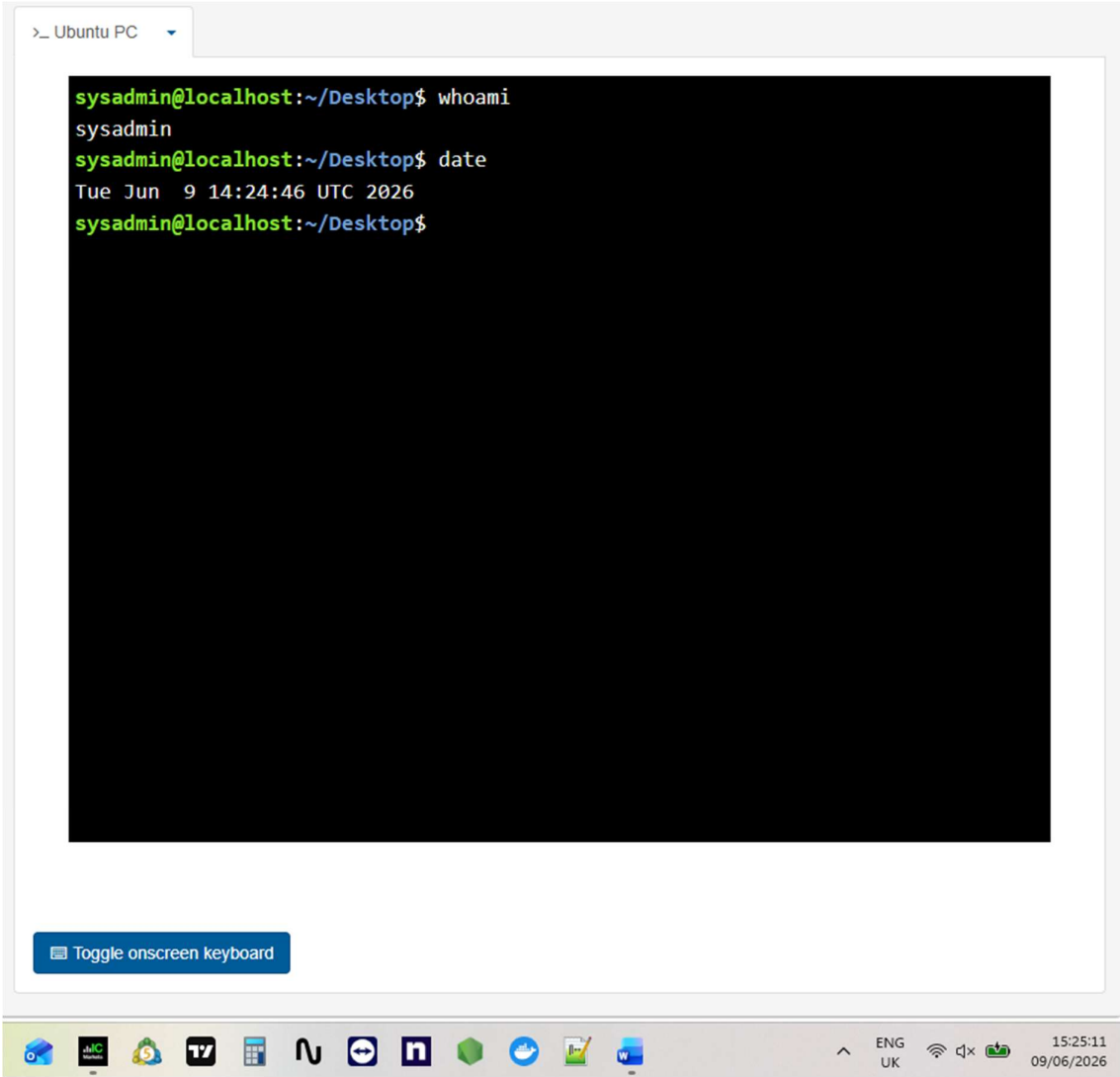
sysadmin@localhost:~/Desktop$
```

The screenshot shows a terminal window titled ">_ Ubuntu PC" with a black background and green text. The user 'sysadmin' is at the prompt 'localhost:~/Desktop\$' and has entered the 'ifconfig' command. The output shows details for the 'eth0' (Ethernet) and 'lo' (Local Loopback) interfaces, including their MAC addresses, IP addresses, subnet masks, MTUs, and packet statistics. Below the terminal window is a blue button labeled 'Toggle onscreen keyboard'. At the bottom of the screen is a taskbar with various application icons and a system tray showing the date and time as '15:23:45 09/06/2026'.

Figure 21: ifconfig command showing network configuration

Example 10:

The `whoami` command is show the name of current user, and `date` is show the current date and time. Figure 22 shows the user is sysadmin, and the system date and time in UTC.



```
sysadmin@localhost:~/Desktop$ whoami
sysadmin
sysadmin@localhost:~/Desktop$ date
Tue Jun 9 14:24:46 UTC 2026
sysadmin@localhost:~/Desktop$
```

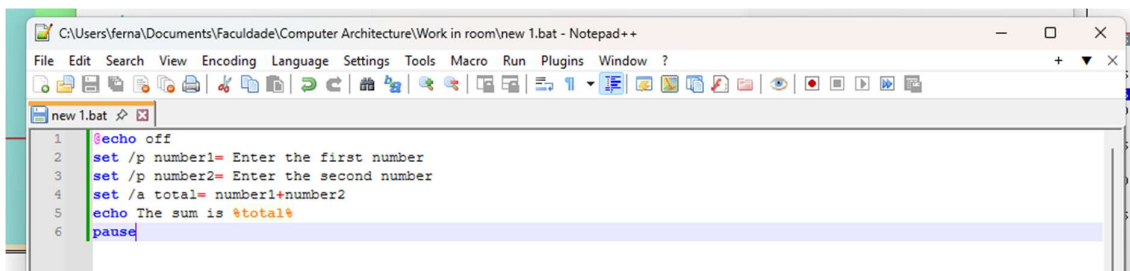
Figure 22: whoami and date showing user and system time

Use of Windows OS scripts

A batch script is a text file with .bat extension that is run a list of Windows commands automatic [10]. Batch script is useful for repeat tasks, like ask for user input, do calculation, or check condition, without type each command by hand every time. They save time for tasks that is done often.

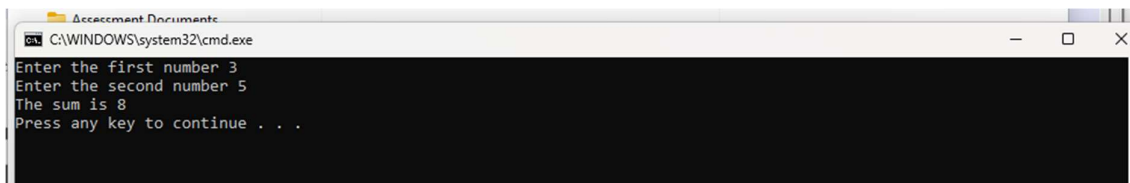
Example 1:

This batch script is ask the user for two numbers and add them together. The line `@echo off` is stop Windows from showing each command in the screen, so only the importante text is visible. The command `set /p number1=` is ask user to type a value and save it in the variable `number1`, and same thing happen to `number2`. The line `set /a total= number1+number2` use the `/a` option to do arithmetic, adding two numbers saving the result in variable `total`. The command `echo The sum is %total%` is display the result `%total%` to show the value that is stored in that variable. Finally, `pause` is stop the window from closing, so user can read the result. Figure 23 shows the code open in Notepad++, and Figure 24 shows the output: after enter 3 and 5, the script is print correct "The sum is 8".

A screenshot of the Notepad++ application window. The title bar reads 'C:\Users\ferna\Documents\Faculdade\Computer Architecture\Work in room\new 1.bat - Notepad++'. The menu bar includes File, Edit, Search, View, Encoding, Language, Settings, Tools, Macro, Run, Plugins, Window, and ?. The toolbar contains various icons for file operations and editing. The text area shows a batch script with the following lines:

```
1 @echo off
2 set /p number1= Enter the first number
3 set /p number2= Enter the second number
4 set /a total= number1+number2
5 echo The sum is %total%
6 pause
```

Figure 23: Batch script asking the user for two numbers (Notepad++)

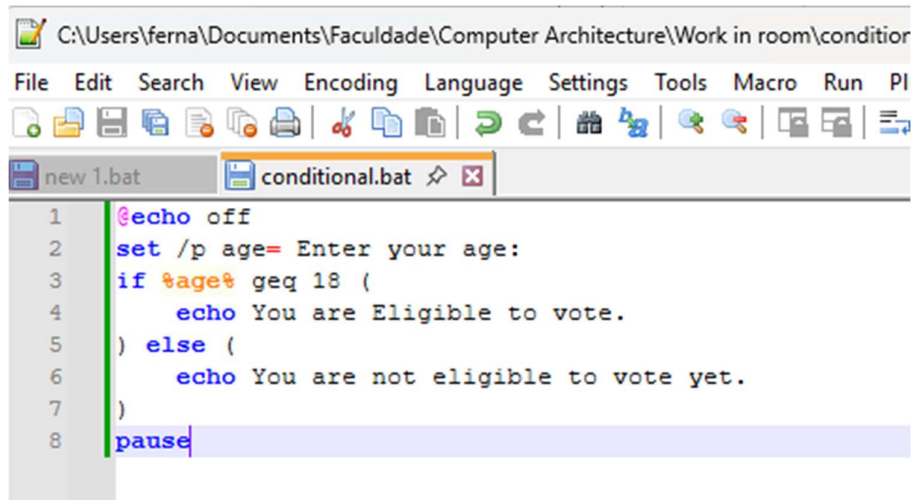
A screenshot of a Windows command prompt window. The title bar reads 'Accessment Documents' and the window title is 'C:\WINDOWS\system32\cmd.exe'. The prompt shows the execution of the batch script with the following output:

```
Enter the first number 3
Enter the second number 5
The sum is 8
Press any key to continue . . .
```

Figure 24: Output of the sum batch

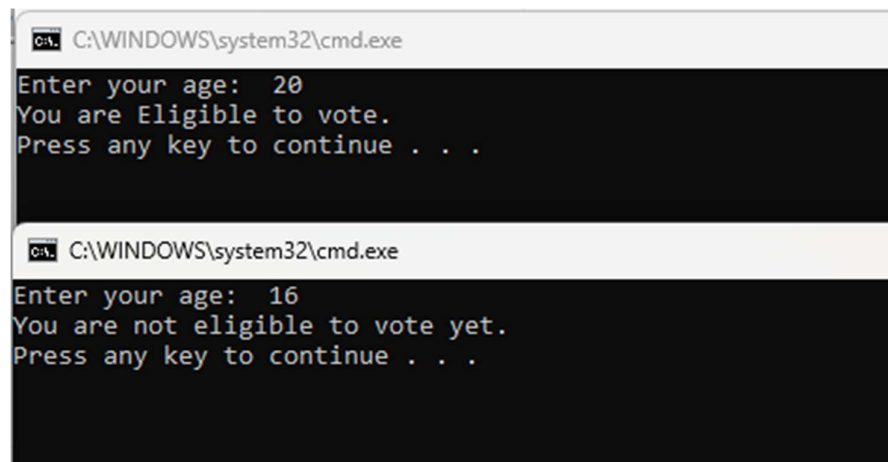
Example 2:

This batch script is check if a user is old enough to vote." Figure 25 shows the code, name 'conditional.bat', open in Notepad++. Figure 26 shows two different output: when the age enter is 20, the script print that the user is eligible; when the age is 16, it print that the user is not eligible yet.



```
1 @echo off
2 set /p age= Enter your age:
3 if %age% geq 18 (
4     echo You are Eligible to vote.
5 ) else (
6     echo You are not eligible to vote yet.
7 )
8 pause
```

Figure 25: conditional.bat script with if/else (Notepad++)



```
C:\WINDOWS\system32\cmd.exe
Enter your age: 20
You are Eligible to vote.
Press any key to continue . . .

C:\WINDOWS\system32\cmd.exe
Enter your age: 16
You are not eligible to vote yet.
Press any key to continue . . .
```

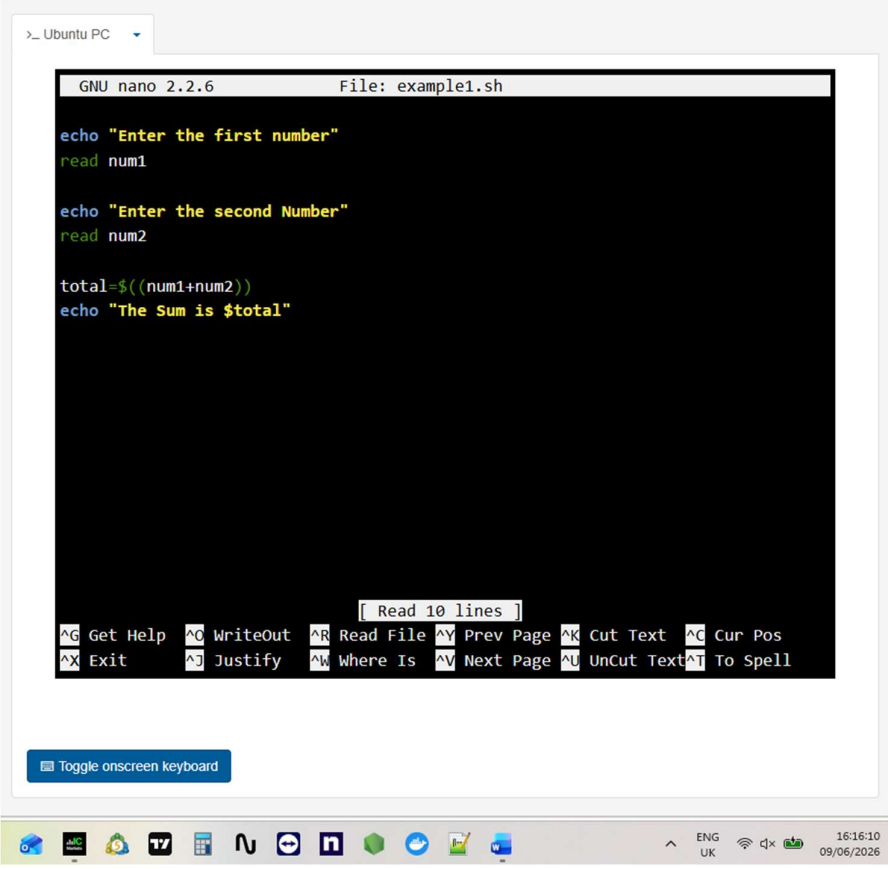
Figure 26: Output of the conditional batch script

Use of Linux OS scripts

A Bash script is a text file with commands for the Linux terminal, usually save with '.sh' extension [11]. Before run, the file need execute permission, using 'chmod +x'. Bash script can ask for user input, do maths, and repeat action with loops, which save time in tasks that is done often.

Example 1:

This Bash script is ask the user for two numbers and add them. Figure 27 shows the script write in the nano text editor, save as `example1.sh`. Figure 28 shows the terminal: the file is create with `nano`, then `chmod +x example1.sh` give the file permission to run, and `./example1.sh` execute it. After enter 3 and 5, the script print "The Sum is 8", same result like the similar Windows batch script.



```
GNU nano 2.2.6      File: example1.sh

echo "Enter the first number"
read num1

echo "Enter the second Number"
read num2

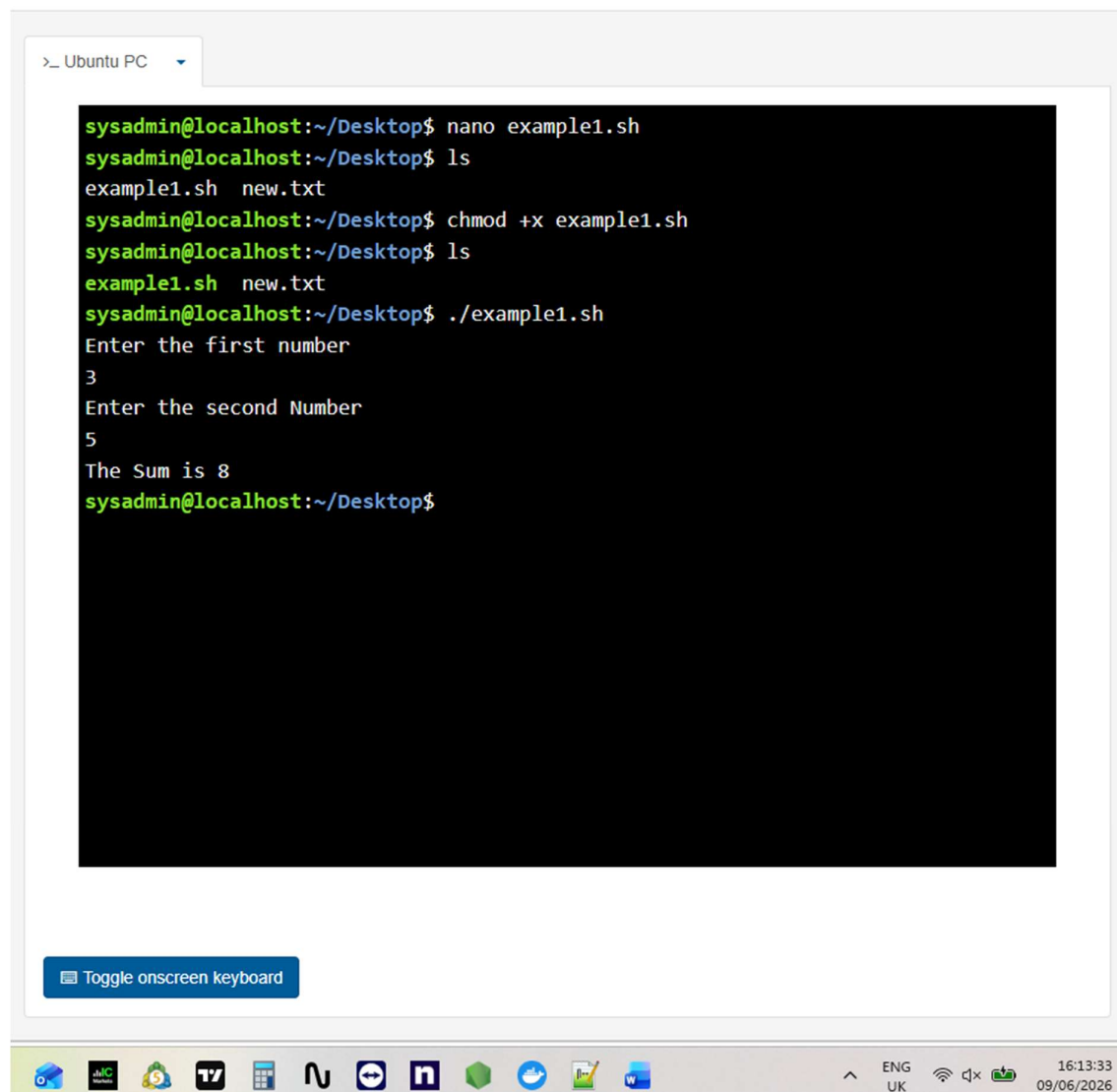
total=$((num1+num2))
echo "The Sum is $total"
```

[Read 10 lines]

^G Get Help ^O WriteOut ^R Read File ^Y Prev Page ^K Cut Text ^C Cur Pos
^X Exit ^J Justify ^W Where Is ^V Next Page ^U UnCut Text ^T To Spell

Toggle onscreen keyboard

Figure 27: example1.sh script written in nano



```
>_ Ubuntu PC ▾  
  
sysadmin@localhost:~/Desktop$ nano example1.sh  
sysadmin@localhost:~/Desktop$ ls  
example1.sh  new.txt  
sysadmin@localhost:~/Desktop$ chmod +x example1.sh  
sysadmin@localhost:~/Desktop$ ls  
example1.sh  new.txt  
sysadmin@localhost:~/Desktop$ ./example1.sh  
Enter the first number  
3  
Enter the second Number  
5  
The Sum is 8  
sysadmin@localhost:~/Desktop$
```

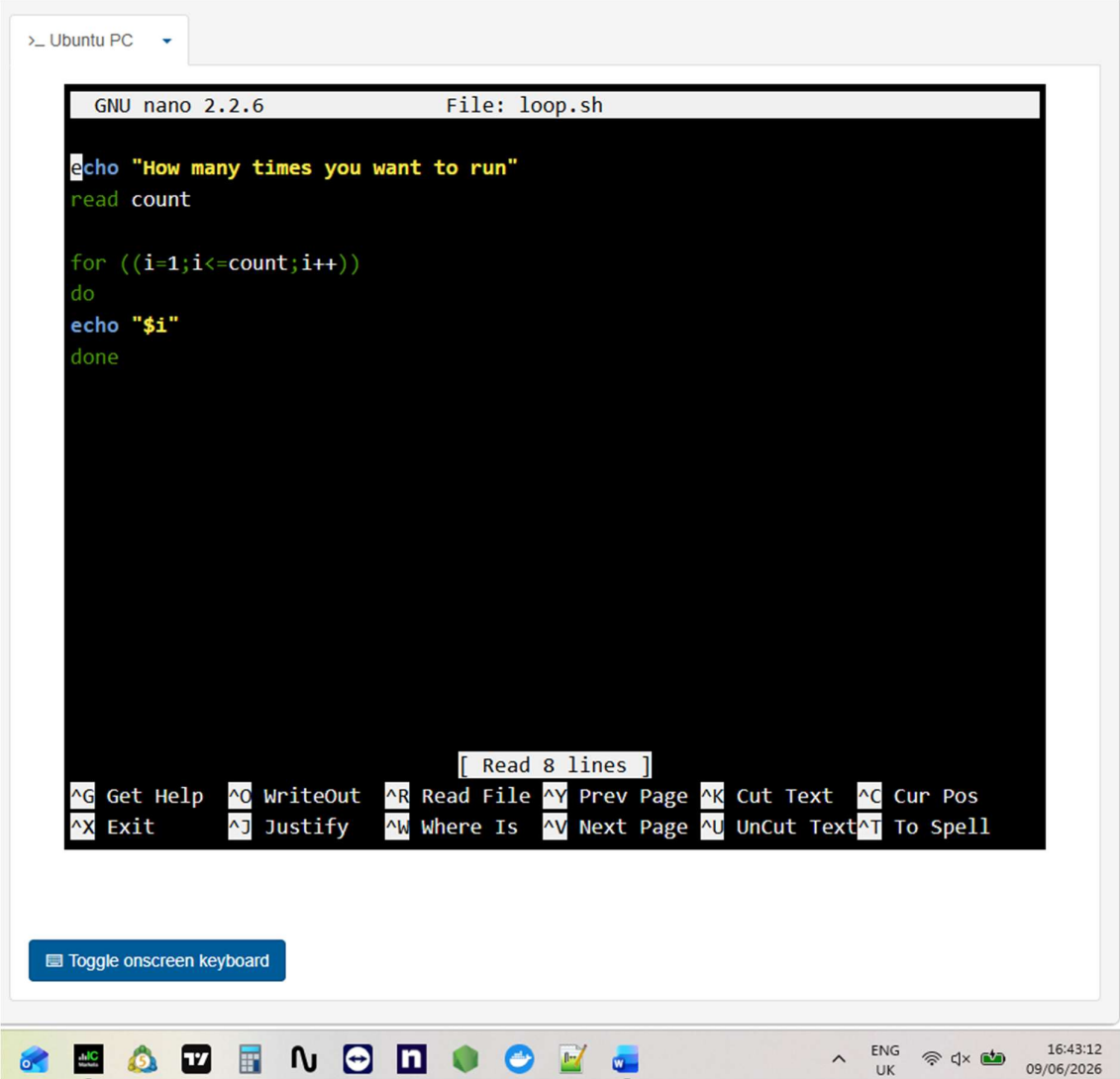
Toggle onscreen keyboard

ENG UK 16:13:33 09/06/2026

Figure 28: Output of running example1.sh

Example 2:

This Bash script is ask the user for a number, and then count from 1 up to that number. The line `echo "How many times you want to run"` ask the question, and `read count` save the answer in variable `count`. Figure 29 shows the script `loop.sh` write in the nano editor. Figure 30 shows the script running: the user enter 9, and the script print every number from 1 to 9, one per line, showing that the loop repeat correctly nine time before stop.

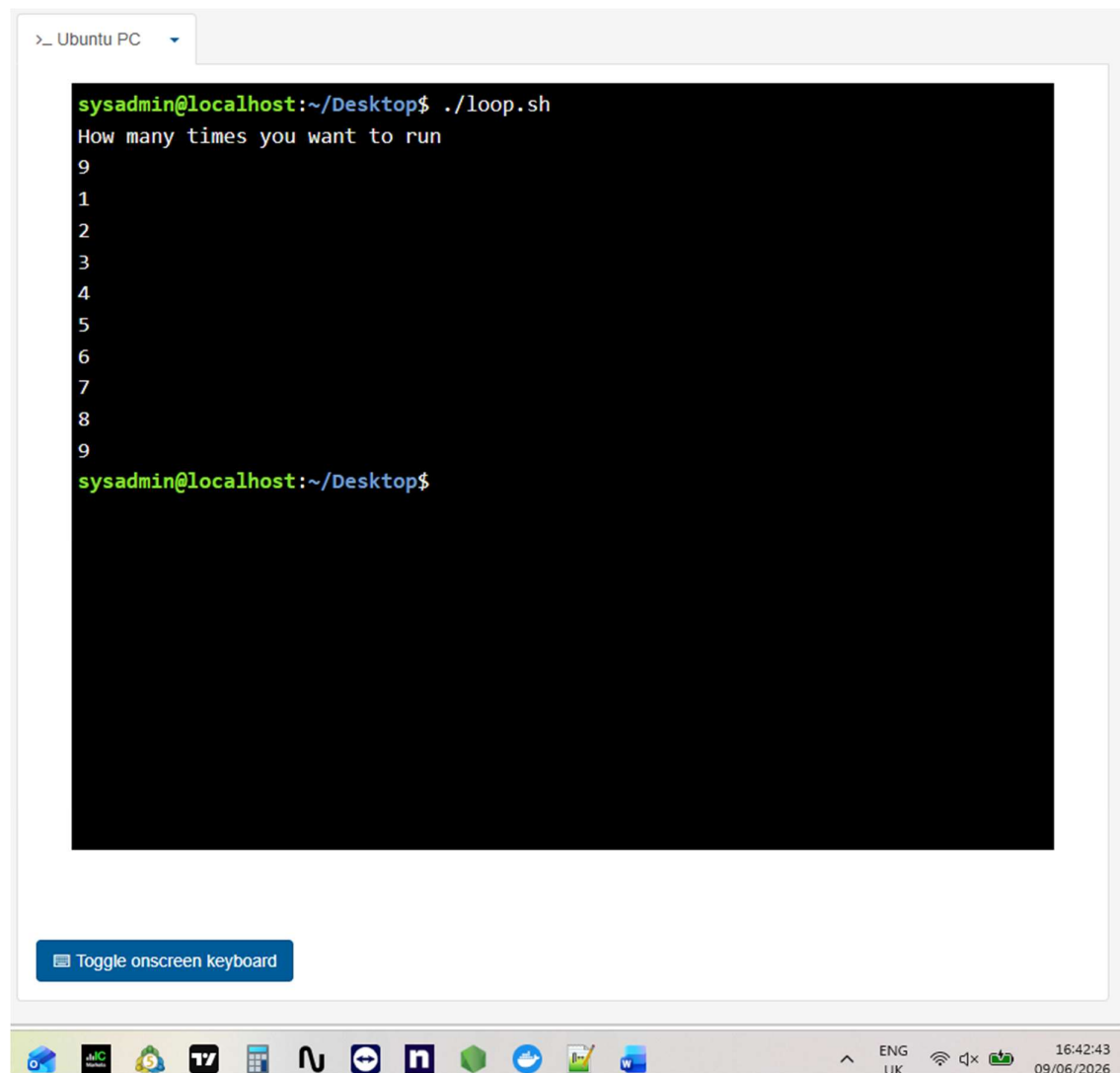
The image is a screenshot of a virtual desktop environment. At the top, there's a tab labeled ">_ Ubuntu PC". Below it is a terminal window titled "GNU nano 2.2.6" and "File: loop.sh". The terminal shows the following script:

```
echo "How many times you want to run"
read count

for ((i=1;i<=count;i++))
do
echo "$i"
done
```

The cursor is at the end of the last line. Below the script, there's a status bar with various keyboard shortcuts: ^G Get Help, ^O WriteOut, ^R Read File, ^Y Prev Page, ^K Cut Text, ^C Cur Pos, ^X Exit, ^J Justify, ^W Where Is, ^V Next Page, ^U UnCut Text, ^T To Spell. A button labeled "Toggle onscreen keyboard" is located below the terminal window. At the bottom of the screen is a taskbar with several application icons (including a web browser, file manager, and terminal) and system status information on the right: "ENG UK", signal icons, and the time "16:43:12" and date "09/06/2026".

Figure 29: loop.sh script written in nano



```
sysadmin@localhost:~/Desktop$ ./loop.sh
How many times you want to run
9
1
2
3
4
5
6
7
8
9
sysadmin@localhost:~/Desktop$
```

Toggle onscreen keyboard

ENG UK 16:42:43 09/06/2026

Figure 30: Output of running loop.sh

Conclusion

It cover how Windows is manage tasks, applications, files, devices and security, showing that this functions is work together to keep a computer usable and safe.

The report also is compare the Command Line Interface of Windows and Linux. Both operating system use similar idea, like changing directory, checking network, managing users, and scheduling tasks, but the exact commands and syntax is different. Windows use commands like ``dir``, ``ipconfig`` and ``net user``, while Linux use ``ls``, ``ifconfig`` and ``su``, showing that the two systems is solve the same problems in different way.

Finally, write Batch and Bash scripts show how repetitive tasks can be automate using variables, user input, arithmetic and control structure like loops and conditionals.

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